the OIL AND GAS JOURNAL

OCTOBER 27, 1958

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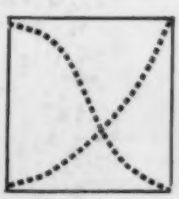

RESERVOIR Engineering

PART 1:

*How to determine effective porosity* p.86

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# Radical new concept in handling bearings speeds shipping

## *Helps you 6 ways when you buy Timken® bearings*

To give you faster, better service when you buy Timken® tapered roller bearings, the Timken Company has developed a revolutionary new concept in warehousing, order processing and shipping. All the elements of the system converge at our huge new $3,000,000 Shipping Center in Bucyrus, Ohio, that enables us to get your bearings out faster and more dependably than ever before. It helps you in six important ways.

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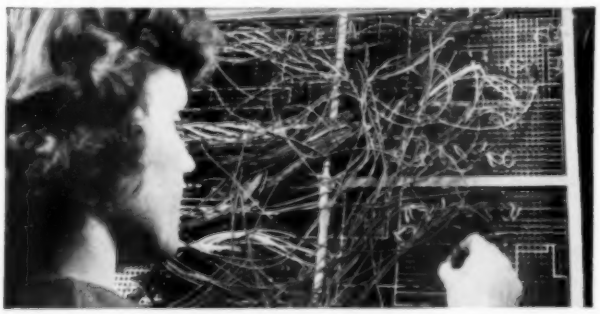
**3. Your order comes completely from one shipping point.** Single source handling further speeds your bearing shipment. **4. Your orders having the same shipping date are consolidated.** Increases handling efficiency at your plant when you receive your Timken bearings.

**5. The new system helps assure delivery when promised,** because it controls our production to meet your needs. **6. It gives you a practically** unlimited source of supply for tapered roller bearings, from our normal warehouse inventory of over 12 million bearing cones and cups.



And the IBM Computer (grid of which is shown above) is the system's heart. It integrates the Shipping Center with all our production facilities—controls the system which speeds order processing and keeps our production in line with your needs. This totally new concept in customer service is one more reason why you get your No. 1 bearing value when you buy Timken bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

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the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Oct. 27, 1958

Big stakes ride on the first liquefied methane cargo:

A converted cargo ship will take first tanker load of liquefied natural gas to England about first of the year.

The ship already has been converted to a complex gas tanker, is undergoing trial runs in the Gulf of Mexico.

If the trip is successful, it opens up tremendous possibilities for the gas industry. Fuel-hungry regions can be supplied from remote fields of the world where gas has gone wasting for lack of an accessible market.

▼ ▼ ▼

Active rotary rigs in U. S. have passed magic 2,000 mark.

Tools at work last week totaled 2,018, highest number since January and the third straight weekly jump this month. Working rigs totaled 1,898 on October 6 and 1,972 October 13.

Cost-cutting trends in the oil business were the big noise at Odessa's Permian Basin Oil Show this year.

Equipment and service firms were bent on showing the oil man how to get the most for his money.

Emphasis went to automatic lease production and custody transfer equipment; lighter, more mobile rigs to handle heavy drilling chores; wellhead and downhole equipment for multiple completions; and pumping units to handle three zones at once.

Price news is on the down side.

Crude sagged 10 cents a barrel on Lower Gulf Coast. Humble cut on 27,000 bbl. daily of Sweden crude and 24,000 bbl. daily of Refugio light. Southern Minerals made same cut on 20,000 bbl. of Sweden. New tops range from $3.20 to $3.35 a barrel.

Kansas crude also was cut 14 cents a barrel by Derby to $3.01 top, except in Southwest Kansas where cut was 9 cents to a $2.81 top. National Cooperative Refinery made same cut.

Gasoline prices, meanwhile, were off in Mid-Continent and East Coast regions. They remained soft on Gulf Coast.

▼ ▼ ▼

Tomorrow's fuels will not ignore petroleum liquids and chemicals—even for above the earth travel.

That's the estimate of E. V. Murphree, president of Esso Research & Engineering, in talk to national energy resources conference in Denver. He says:

...For purely military purposes—such as long range missiles—solid propellants probably will replace liquids.

...For outer space travel, liquids will continue to play a very important—if not predominant—role.

Murphree predicts future fuels will continue to be the product of interdependence and interrelation of petrochemicals and petroleum.

Wanted: A lightweight engine that will operate on any fuel from middle distillates to 83/91 gasoline.

That's the goal of the military for its ground vehicles.

The reason: A multifuel engine would simplify supply problems and allow our armed forces to fight anywhere in the world on fuels shipped either from the U. S. or obtained in the area of action.

Army Ordnance already is making extensive evaluations of 40 prototype multifuel engines.

▼ ▼ ▼

Offshore wildcat in Lake Erie reportedly is being abandoned by New York State Natural Gas Co. at a depth of 5,098 ft.

The Medina section (Silurian) was fractured after a gas show was encountered in drilling. No further information has been released. Company plans to move over to Block 2 in the lake for another wildcat.

Lake drilling is proving both tough and costly: Waves as high as 23 ft. were encountered with winds up to 60 mph. Drilling platform cost $212,000 with $5,100 more for foghorn and warning lights, and $10,000 for towing platform to site, jacking it up on its legs.

New drilling-depth record for Kentucky has been set at 9,920 ft. in the Cambrian.

Record is held by United Fuel Gas 1 Williams wildcat in Breathitt County, 4 miles east of Jackson. Test is now drilling below 9,920 ft. United Fuel Gas also held old record.

An unusual Williston basin discovery, isolated by previous dry holes, has been brought in by Skelly Oil.

Skelly's 1 Tank flowed 218 bbl. daily on small choke. It is west of Blue Buttes field, McKenzie County, North Dakota, and opens the immediate discovery area to future development.

Another dry-hole area in Morrill County, western Nebraska, is headed for good oil production.

Nebraska Drillers and Mar Oil Co. got 2,200 ft. of free oil on drill-stem test of the Dakota "J" sand at the 1 Stark, 2¼ miles north of Gaylord Field. Well is in center of a 3-mile by 1½-mile dry-hole area.

Arizona's top producing oil well has been completed by Humble in East Boundary Butte field on south edge of Paradox basin.

Well had final flow of 562 bbl. daily on small choke.

Another Humble well to the west is nearing possible pay.

Flurry of new wildcat locations has been set off on west side of Utah's Paradox basin by oil show at TGT's Poison Springs wildcat in Garfield County.

Wells have been staked by Skelly, TGT, Texaco, El Paso Natural, Superior, and a group including Triton, Sun, and Kilroy of Texas.

Two types of bidding techniques will be offered oil companies interested in future California offshore parcels.

Strictly wildcat territory will be put up for leasing with the royalty rate the bidable factor.

Parcels on producing structures will go for high cash bonus bids with a sliding scale royalty beginning at 16⅔%.

▼ ▼ ▼

Growing importance of water flooding is being shown in Illinois-Indiana-Kentucky area.

In 7 years recoveries from flooding jumped from 6% to 35% of total production. Total production is expected to remain steady in next 10-15 years. But oil produced from floods will jump to 60% of total and after that reach 90 or 95%.

New study by Albert E. Sweeney, Jr., of Interstate Oil Compact Commission shows tri-state area is first in percentage of its oil coming from flooding. It's second only to Texas-Oklahoma-Kansas region in volume.

▼ ▼ ▼

Pressure is on Iraq Petroleum Co. from Iraq's new military government for action in its demand for new concessions from the company.

Revolutionary government needs something dramatic to spring on its people to strengthen its control. IPC has agreed in principle to give up some concession areas which could then be offered other companies and has agreed to step up production.

Something more concrete is wanted by the government for

publicity purposes. It believes IPC is dragging its feet.

IPC may be having trouble getting its multiple owners to agree on what will be done. The company is owned by British Petroleum, Cie. Francaise des Petroles, Royal-Dutch Shell, Jersey Standard, and Socony Mobil.

▼ ▼ ▼

The Alberta-to-Montreal crude line is opposed in reports based on the Canadian government surveys.

Surveys were made by the Federal Department of Trade and Commerce and the reports have been turned over to Trade Minister Gordon Churchill.

The pipeline is backed by a group of independent oil producers but strenuously opposed by the majors in Canada. The surveys are expected to have a profound effect on government decision whether to participate in the project.

Evidence that summertime gas load can be boosted sharply with larger sales of gas air conditioning, outdoor gas lights, and other gas-using equipment is now available.

Arkansas Louisiana Gas survey in Little Rock shows these gas-sales gains this year: June, up 24%; July up 19%; August up 22%. Average consumption per customer for period was 3.3 M.c.f., a 22% increase.

Back of this summer gain: Sales in last year of more than 1,600 gas air conditioners and 20,000 outdoor gas lights.

▼ ▼ ▼

All 1958 engineering graduates have been placed.

The Engineers Joint Council reports the men were all placed a month after graduation. A spring-time survey had shown a large number of prospective graduates had no solid job offers.

Here's how the graduates fared: 83.5% got jobs; 8% went to graduate schools; 7.5% entered military service; and 1% had job offers which they were considering.

On the labor scene: A 16-day strike has ended at Socony Mobil's 87,000-bbl. Paulsboro refinery. Independent union members return to work without pay raise, reserve the right to continue wage negotiations for 60 days...Chicago's Teamsters are suing independent-owned service stations for non-compliance with union contracts. Teamsters say they'll settle for nothing less than adherance to $2 hourly wage... OCAW officials held Denver huddle last week to chart ways to step up oil-industry bargaining...California Trucking Assn. will seek rate increases for tank-truck hauls to cover wage increase recently granted Teamsters.

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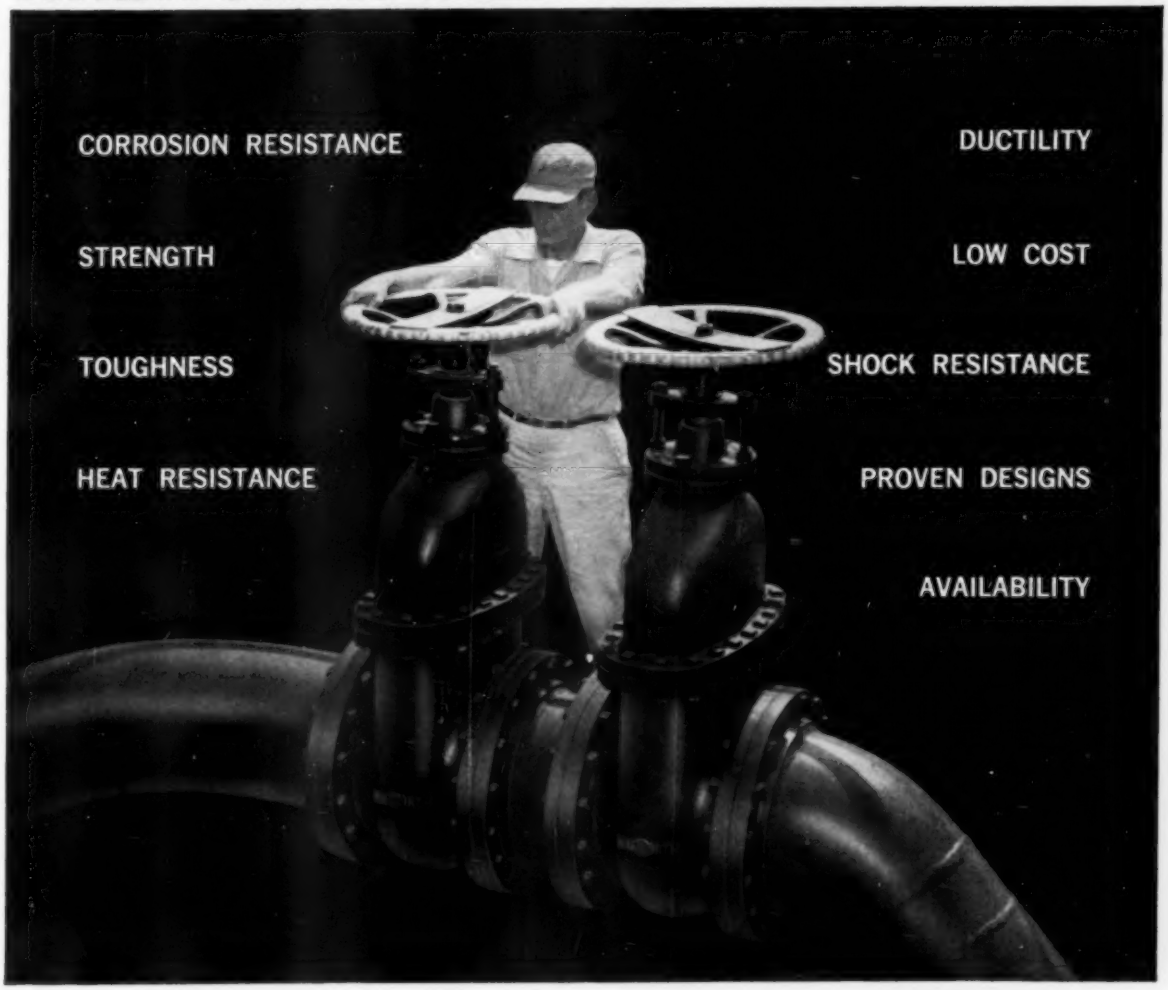


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# TECHNOLOGY—OPERATION

**Drilling-Production**

Water-Treating, Injection Project Boost Flood Efficiency **66**

*By W. F. Walker*

A system to collect oil and water at centrally located collection sites has been installed by Sun Oil Co., operator of Segment 3, SACROC unit. This means savings in required lines and over-all increase in operating efficiency.

Two New Devices for Blowout Protection **74**

*By W. E. Harrelson and J. E. Ortloff*

The stinger, a double-acting cylinder with a packer attached to the end of the rod, and a wrap-around and overshot closure device are two new and very effective tools for surface protection.

Reservoir Engineering, A New Series **86**

*By E. T. Guerrero and F. M. Stewart*

These articles will provide a fresh approach to the study of reservoir engineering. They will contain a minimum of theory and a maximum of practical application. Frequency will be about once a month. This first installment is on determination of effective porosity.

**Exploration**

Gas Future Looks Promising in Western Canada **69**

*By Jack G. Stabback*

The western Canada sedimentary basin, containing some 700,000 sq. miles, is thought to contain 23.6 trillion cubic feet of gas reserves. These are defined as 100% of the proven reserves plus 50% of the probable reserves, all on terms of pipeline gas.

**Pipelining**

Photogrammetry: New Way to Survey Pipeline Routes **89**

*By Maurice E. Fuller*

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Pipeline Construction Report **103**

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A Different Kind of Bundle Cleaner **84**

A new jetting tool for cleaning heat-exchanger tube bundles removes many deposits which could not be removed satisfactorily by other methods.

Save Money and Boost Octane With Propylene Alkylation **94**

*By L. J. McGovern*

Magnolia Petroleum Co. has installed a propylene alkylation unit at its Beaumont, Tex., refinery. The 8,000-bbl. unit will raise the refinery's octane pool by 0.6 F-1 octane number.

Refinery Construction Report **101**

Here is the status of construction on the Texas Gulf Coast and in the East-Southeast section of the United States and Canada.

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Value of low-gravity crudes depends on such things as sulfur content, amount of naphthenic oils, and similar considerations.

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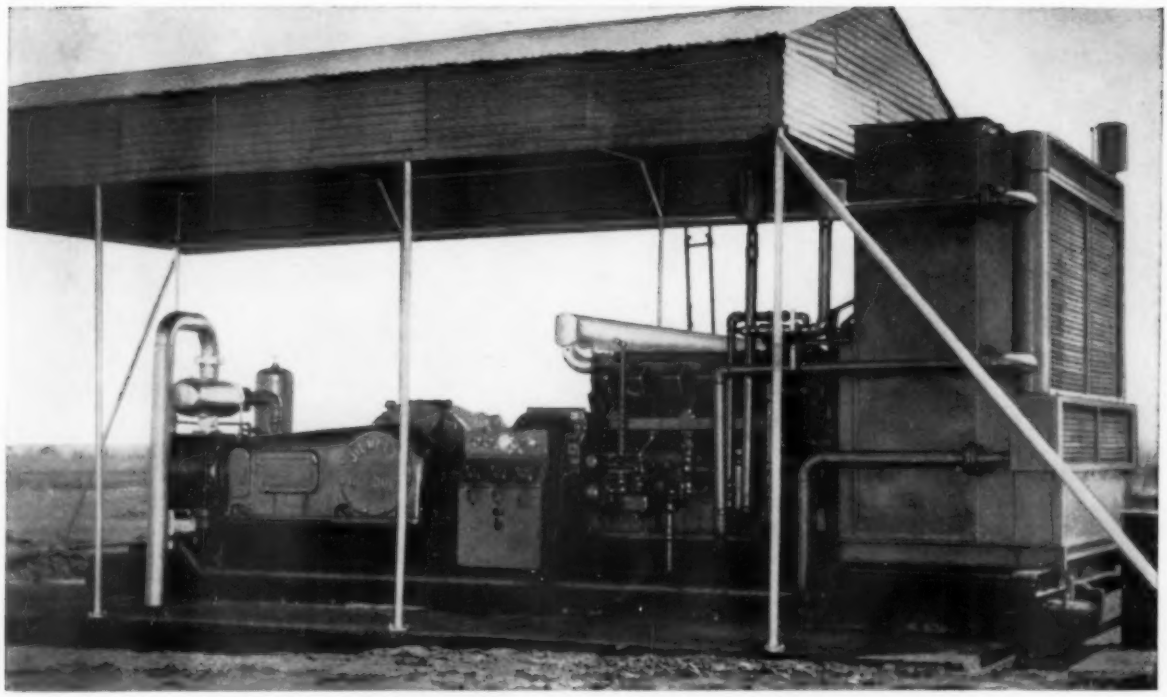

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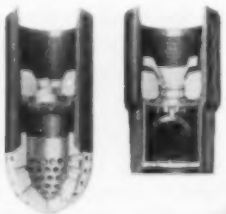

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Foxboro Capacity Dynalog* Recorder, located upstream from receiving station, records dielectric constant of pipeline product — telemeters it ahead to delivery point.

# New Accuracy in Interface Detection!

## Unique Foxboro System profiles interface in advance — helps reduce product contamination at switch-over

Now your pipeline dispatchers can accurately chart the shape of an interface in advance — pinpoint their switch-over of product runs!

The Foxboro Pipeline Interface Detection System is based on the fact that even slight differences in grades of petroleum products have measurably different dielectric constants. Sensitive capacity Dynalog* Recorders measure this difference, both at the pipeline delivery station, and at a point one or two miles upstream. Foxboro Teletax* Telemetering brings the two measurements together on a single chart at the delivery station.

From the shape of the upstream record, the dispatcher selects the best cut point well before the interface arrives, and sets index at this point. When station interface record matches index, switch-over is made.

Foxboro Interface Detection eliminates sampling and guesswork — holds product contamination and loss to a new minimum. Systems in use today include both dual-measurement and single-measurement systems. Ask your nearby Foxboro Field Engineer about them, or write for Bulletin 20-11. **The Foxboro Company, 6010 Norfolk St., Foxboro, Massachusetts.**

*Reg. U.S. Pat. Off.

2-pen Capacity Dynalog Recorder, at delivery station. One pen records dielectric interface measurement telemetered from upstream station. Second pen records measurement at delivery station. From upstream record, dispatcher selects best cut point, and aligns index with this point on chart. When second pen matches index, switch-over takes place, either automatically or manually.

FOXBORO

REG. U.S. PAT. OFF.

**INTERFACE DETECTION SYSTEMS**

## Treat and squeeze effectively...

## with Halliburton's unmatched combination of tools, techniques and materials

Halliburton offers a complete line of packers and auxiliary tools for remedial squeeze cementing, hydraulic fracturing, acidizing and chemical services wherever it is necessary or desirable to confine applied hydraulic pressure to subsurface formations.

These tools, combined with Halliburton's big world wide service fleet and oil field know how, give you the ultimate in desired results.

Call your local office or write the Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

HALLIBURTON

OIL WELL CEMENTING COMPANY

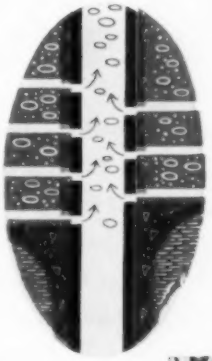
# *"water hunter"...* HALLIBURTON DOC

*(Diesel Oil Cement)*

This versatile product uses the water in the formation to produce a set cement of high density, high compressive strength and very low permeability.

Since DOC is composed only of cement, diesel oil and Halliburton's new and more efficient dispersant DOC-3, it will never set hard until contacted by water.

Initial contact of DOC with water thickens the slurry. This desirable feature provides effective water shut-off with relatively small volume of this low fluid loss slurry.



HOWCO HYFLO:

Especially effective in the breakdown of water and emulsion blocks. Synergistic action increases effectiveness of its component chemicals. This surfactant effectively reduces interfacial tension between water and oil. Use Howco Hyflo where rapid-positive action is required.

RTTS (Retrievable Test-Treat-Squeeze) PACKER:

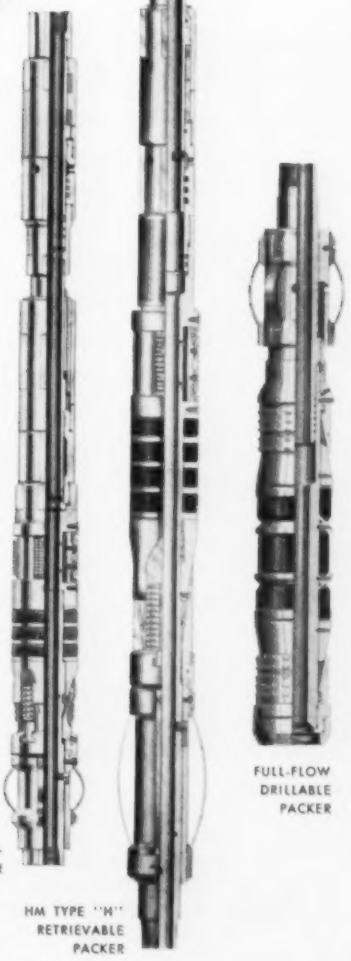
A dependable combination tool for performing a multiple of jobs with a single trip in the hole. The RTTS Packer has full opening mandrel for treatment with large fluid volume or passage of tubing type perforating gun and a safety joint with drillability features for squeeze cementing.

HM (Hydro-Mechanical) TYPE "H" RETRIEVABLE PACKER:

A full-opening, heavy duty, hook wall type packer designed to be run on tubing into cased hole providing a seal above a section to be fractured, acidized or tested. Permits pumping large volumes of fluid through tool with minimum pressure drop.

FULL-FLOW DRILLABLE PACKER:

An economical, full-opening drillable packer, designed especially for formation fracturing when set in either casing or hard uncased formation near to true bit size with pressures to 3,500 psi below the packer. Especially effective, when used with full-opening tubing check valve, as an open hole packer in gas wells with one or more pay sections treated separately and with no fluid load in the annulus on top of the packer.



RTTS (RETRIEVABLE TEST-TREAT-SQUEEZE) PACKER

HM TYPE "H" RETRIEVABLE PACKER

FULL-FLOW DRILLABLE PACKER

HALLIBURTON

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

**SPECIAL TOOL SERVICES AND PRODUCTS**

284 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

# 19 GASO PUMPS FOR THE Four Corners Pipe Line

The pumps that move the crude from the gathering lines to the main line of the fifty-million dollar Four Corners Pipe Line are GASO Pumps. In all, Gaso has supplied the line with 19 pumps in models to meet the individual requirements at the feeder stations and in the Kingman and Corona pressure reducer stations. Typical feeder station installations:

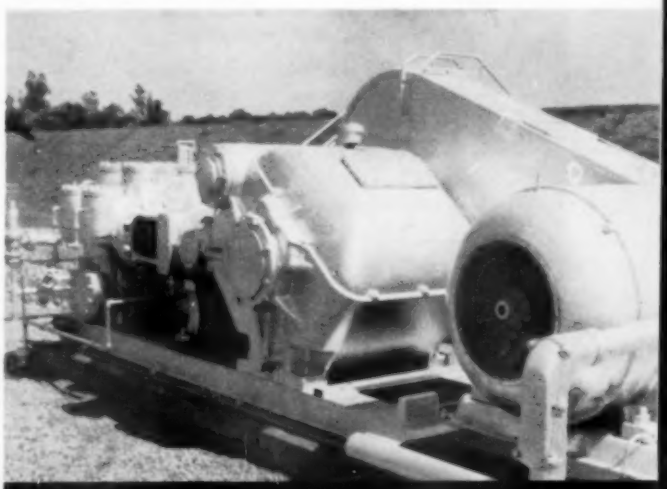
At Aneth: Figure 2652 Gaso Duplex Piston Power Pump (4" to 7¼" x 12").

At Arrowhead, Desert Creek, Rice, Little Mesa, Bluff, and East San Juan: Figure 1849 Gaso Duplex Piston Power Pumps (2½" to 4" x 10").

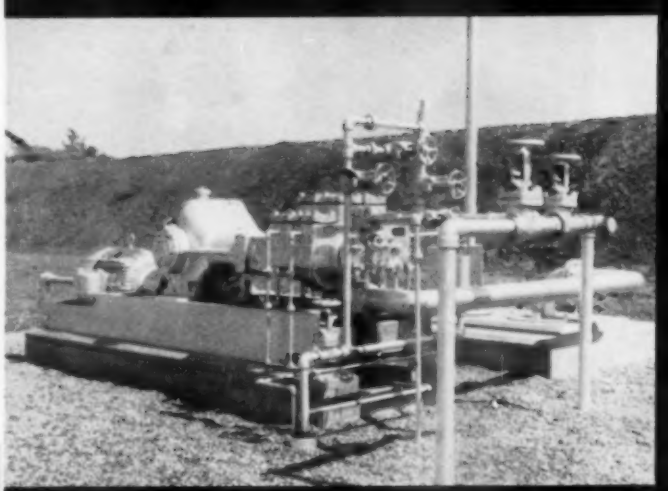
At Ratherford and White Mesa: Figure 1550 Gaso Duplex Piston Power Pumps (2½" to 5" x 10").

At McElmo Creek, Ratherford, San Juan, White Mesa, West Aneth and East Aneth: Figure 1753 Gaso Duplex Piston Power Pumps (4" to 7½" x 10").

The Gaso line includes many types and sizes of duplex piston and triplex plunger pumps with moly-iron, steel, and bronze fluid ends for handling crude oils, petroleum products, and salt waters under a wide range of capacity and pressure requirements. May we send you our latest catalog, just released?



Gaso Fig. 2652 Pump handling approximately 900 barrels per hour at the Corona pressure reducing station of the Four Corners Pipe Line. Powered by a 200 HP electric motor, operating at 78 RPM.



Another Four Corners installation: Fig. 2249 Gaso Duplex Piston Power Pump operated by 15 HP electric motor.

**DISTRIBUTORS**

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Shreveport, La.—W. L. Somner Co.
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**GASO PUMPS** *for every oil industry need*

GASO PUMP & BURNER MFG. CO. • 901 E. First St., Tulsa, Okla. • Export Office: Empire State Building, New York, N. Y.

# ALUMINUM GATE VALVES

## BY DARLING

***FEATURING:***

**unmatched advantages of DARLING fully revolving double disc parallel seat gate valve principle!**

There's new economy to be gained in the handling of "problem" fluids and gases with Darling aluminum alloy gate valves . . . now available in ½" through 24" sizes. We have data on initial and long-range costs and performance that will interest you. Write for facts.

DARLING VALVES

**DARLING VALVE & MANUFACTURING CO.**
Williamsport 1, Pa.

# GREAT LAKES STEEL ANNOUNCES ITS NEW GLX-W STEELS...

*The Great Lakes Family of High-Strength Steels*

N·A·X FINEGRAIN STEEL

Lets you design superior performance, longer life and less weight into your product. Many diversified applications.

N·A·X HIGH-TENSILE STEEL

Offers all the characteristic features of N-A-X Finegrain, plus greatly enhanced resistance to atmospheric corrosion.

GLX W

A series of fine grained, mild carbon steels. They have unusually high strength, toughness and weldability.

N·A·X N-A-XTRA STEELS

Quenched and tempered steels of excellent weldability and toughness, with yield strengths from 75,000 - 110,000 psi.

N·A·X HIGH MANGANESE STEELS

N-A-X High Manganese and High Manganese Special Killed. These steels give yield strengths up to 50,000 psi.

# A series of fine grained mild carbon steels of unusually high strength, toughness and weldability

Metallurgical research has produced the new GLX-W Series of High-Strength steels. An exceptionally fine grain structure in this series makes possible the high strength, good notch toughness and excellent weldability of these steels. The series consists of GLX-45-W, GLX-50-W, GLX-55-W and GLX-60-W, based on minimum yield strengths of 45,000 psi up to 60,000 psi.

## IMPORTANT MECHANICAL PROPERTIES OF GLX-W STEELS

**STRENGTH**—up to 60,000 psi yield strength with good ductility.

**NOTCH TOUGHNESS**—good notch toughness at normal and subnormal temperatures.

**WELDABILITY**—low carbon and manganese content assures freedom from underbead cracking under all conditions.

The combination of these properties of the GLX-W steels, together with lowered material and manufacturing costs and simplified fabrication processes, indicates their use for gas transmission lines and drill casings as well as for many other applications.

For additional technical information about GLX-W steels, write

Product Development Division, Dept. V-8

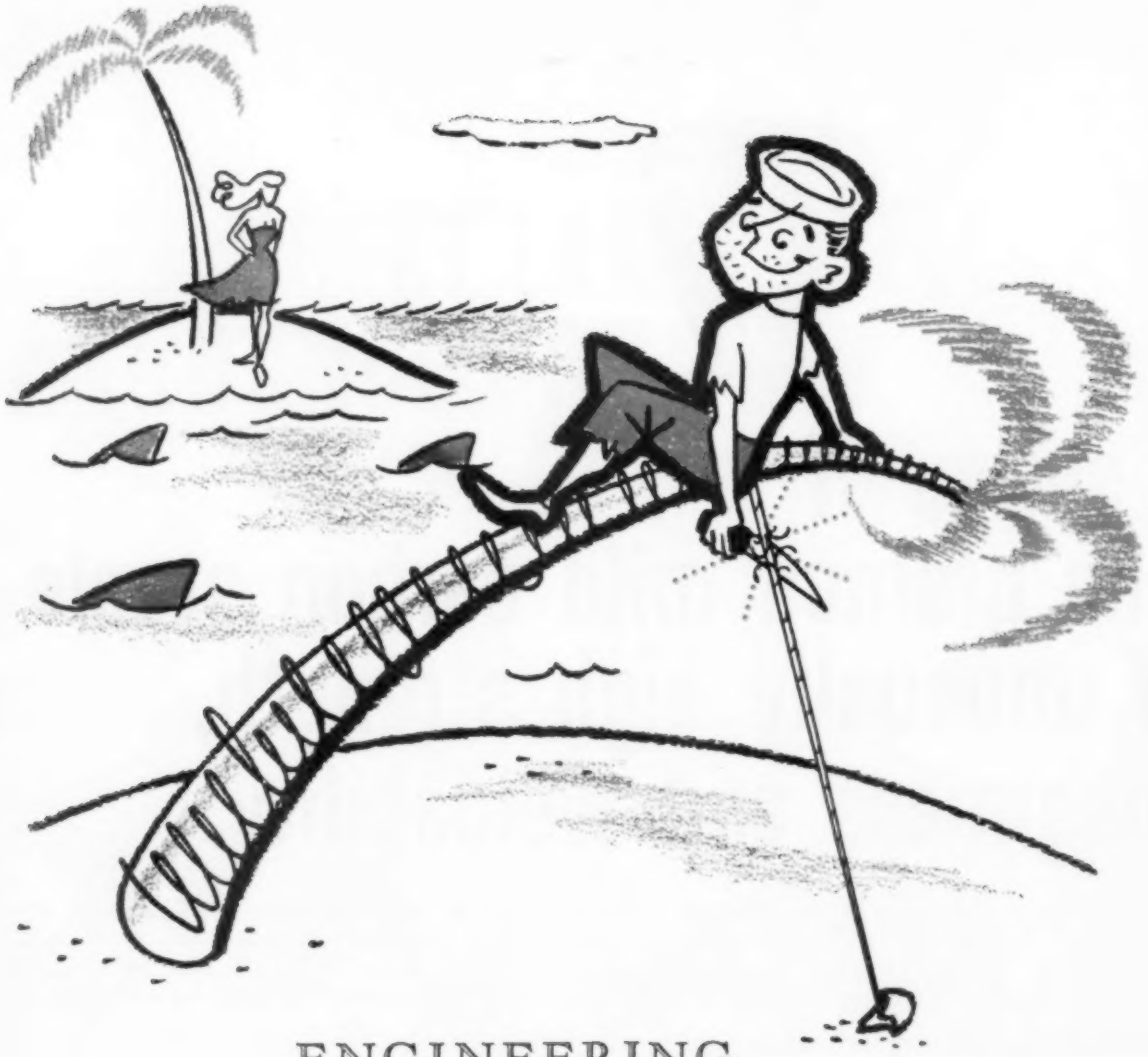
**GREAT LAKES STEEL CORPORATION**

Detroit 29, Michigan

**GLX-W**

another new product developed by a division of

**NATIONAL STEEL CORPORATION**



# ENGINEERING KNOW-HOW

DAU's
Hyrecos
Emulsion Treaters
Separators
Direct Heaters
Indirect Heaters
Glycol Dehydrators

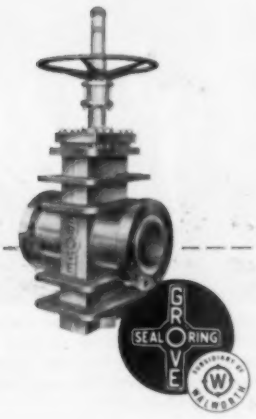
The best solution to any problem is based on experience. The Parkersburg Rig & Reel Company, pioneers in oil and gas handling equipment, is staffed with engineers who are experienced in solving all types of production processing problems. For the most economical answer to your oil and gas handling problem, look to Parkersburg's engineering know-how for the answer.

THE PARKERSBURG RIG AND REEL CO.

THE PARKERSBURG RIG & REEL COMPANY
*Division of Parkersburg-Aetna Corp.*

PRODUCTION EQUIPMENT DIVISION OFFICES: P. O. BOX 13295, HOUSTON, 19, TEXAS

# .....wipe out the need for lubrication




Lubrication problems are wiped out with the squeegee action of the exclusive Grove Seal-O-Rings. Up or down movement of the gate through the floating seats cleans and polishes both upstream and downstream surfaces. Foreign matter which could cause sticking, distortion, or abrasion is removed. The "O" Rings provide smooth action through the seats and bubble tight pressure seals on both sides of the gate. Specify Grove Seal-O-Ring Gate Valves. When they're set you can forget about lubrication or sealing compounds forever.

Grove valves never require lubrication

**GROVE VALVE & REGULATOR COMPANY**

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**From Liberty Mutual: a forward-looking concept of workmen's compensation coverage which provides**

# Protection in

## —the real key to lower insurance

### The real cost of your compensation protection is not the first price, but the final cost

Any insurance company or agent can quote you a price on business insurance for your people and your assets. Yet the ultimate cost of your coverage is, in a very real sense, determined by you. If you have an unfortunate number of accidents and suffer large losses over a period of time, you are actually contributing to a higher insurance rate for yourself. Anything you can do *now* to cut down on accidents and losses will help toward cutting your premium costs *in the future*.

This is why Liberty Mutual—the company with the largest experience in workmen's compensation service—has developed over the years a forward-looking concept of business insurance which gives you protection in depth. From the start of your Liberty coverage, a wide range of skills and resources can be put to work to help you anticipate and avoid accidents and loss on your drilling sites, lessen their impact if they happen and keep future costs down.

### In today's business climate, *PROTECTION IN DEPTH* can be more important to you than ever

Today every oil-well driller—whether he employs 25 people or 250—must take a new and careful look at expenses. The protection in depth you get from Liberty can help you trim excess dollars from your insurance costs without sacrificing any of the coverage you need to safeguard your business.

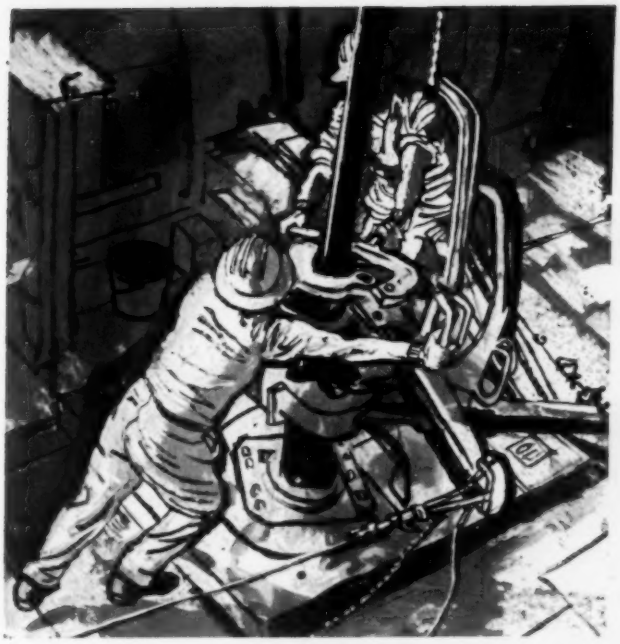
This kind of protection has enabled Liberty Mutual to set an impressive cost-cutting record. In turn, this has meant steady growth in business written and a large share of "blue-chip" accounts. Because we deal directly, our salesmen have at hand the experience of the entire company to draw on, and they are expected to have the skill to see that it is applied to the problems of any policyholder, large or small. This direct-dealing, mutual form of operation not only helps policyholders control loss, but is also one reason why over the years Liberty has been able to return more than $455 million in dividends to policyholders.

We believe that protection in depth can today lead to significant improvement in your insurance cost picture. We invite you to become acquainted with protection in depth now.

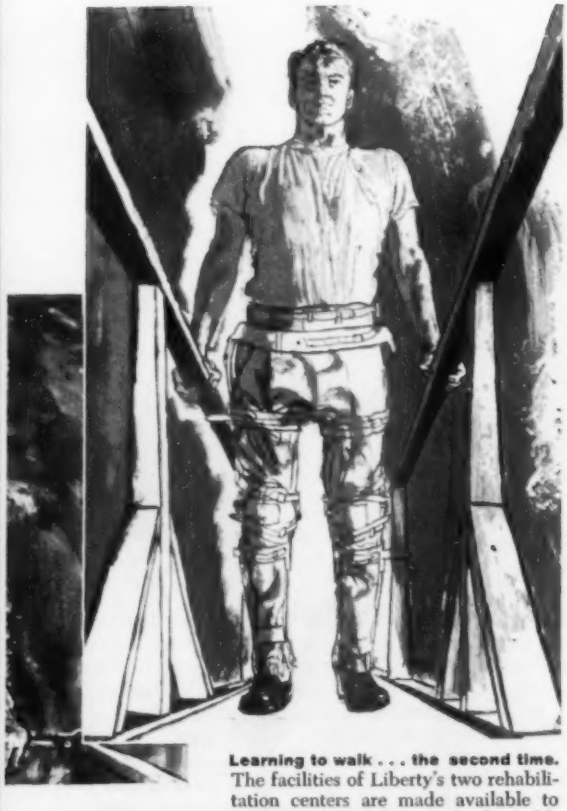
**Test for tiredness.** At Liberty Mutual's 86-acre research center, a "worker" goes through his paces so that our scientists can learn to measure human effort and fatigue. The goal: new knowledge of when worker efficiency begins to fall off and cause late-hour accidents.

# depth

## cost today



**Finding trouble before it happens.** Liberty's loss-prevention engineers visit your rig, spot hazards, suggest ways to eliminate them. Result: fewer lost-time accidents, lower insurance costs in the future.



**Learning to walk . . . the second time.** The facilities of Liberty's two rehabilitation centers are made available to badly injured employees of policyholders. Through therapy and prosthetics know-how, patients help themselves recover, get back on the job.

### The broad range of Liberty's special skills and resources protects four vital areas

From Liberty's protection-in-depth resources—many unique in the insurance business—has come a new, 4-way insurance package for oil-well drillers. Combining four coverages in one policy, it can save you money, assure you of the best possible protection in depth. Here's what this 4-way policy does:

**Protects your rig.** Gives you realistic coverage against fire, wind, explosion, blowout, collapse and many other disasters. Loss-prevention engineers work with your crew, help spot accident hazards, give money-saving recommendations.

**Protects your men.** We help you set up your on-the-rig medical program. Our hygienists check working conditions, and when accidents do happen, our claimsmen assure speedy medical care.

**Protects your fleet.** Safeguards you against damage to your trucks and company cars, and against crippling lawsuits for liability.

**Protects your company.** Hazards on a drilling site are great. Jury awards for bodily injury can put a driller out of business. Our Public Liability coverage protects your company against this kind of trouble.

Pictured on these pages are some of the many "extras" that put teeth into this 4-way protection-in-depth policy. All of them are available to any policyholder who needs them.

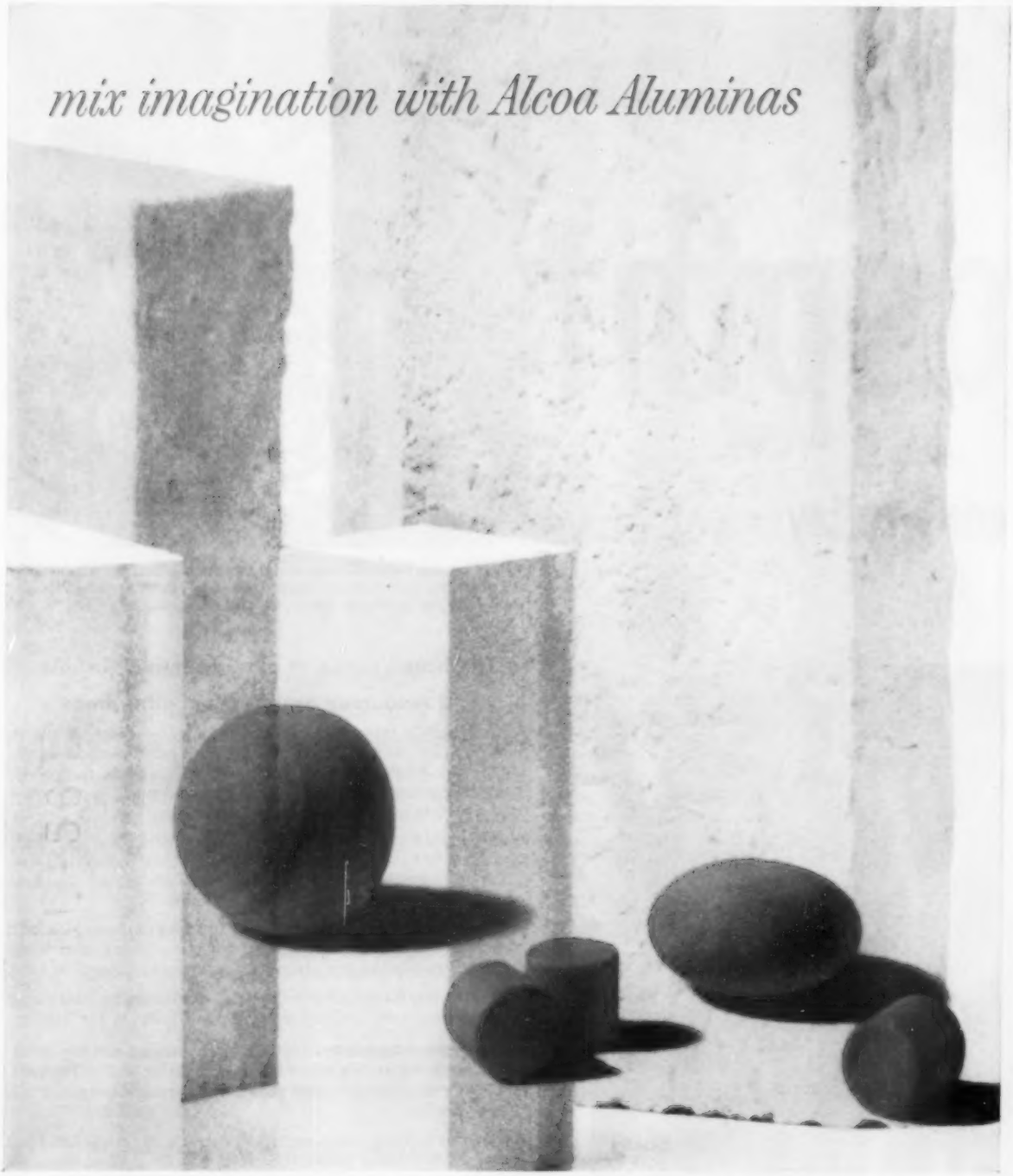
Look for more from

# LIBERTY MUTUAL

*...the company that stands by you*

LIBERTY MUTUAL INSURANCE COMPANY • LIBERTY MUTUAL FIRE INSURANCE COMPANY • Home Office: Boston
Insurance for: Automobiles, Liability, Group Accident and Health, Fire, Workmen's Compensation, Marine, Crime

*mix imagination with Alcoa Aluminas*



**to beef up these backbones of industry:** Few industries could prosper without high performance ceramic refractories, mill liners and grinding media. They are the backbones of industry . . . and they will serve best, serve longest when imaginative engineering puts Alcoa® Aluminas in their composition. These pure aluminum oxides increase refractoriness in direct proportion to the amount used . . . they increase stability and strength under load at high temperatures . . . improve resistance to thermal and structural spalling or deformation . . . minimize corrosion and erosion. Small wonder that users and makers of refractory shapes and castables, ceramic grinding media and mill liners have found it pays to mix imagination and engineering with Alcoa Aluminas . . . for top performance at reasonable cost.

Alcoa does not manufacture refractories, mill liners or grinding media. We do supply aluminas to makers of the best of these products. For their names, write ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 715-K Alcoa Building, Pittsburgh 19, Pennsylvania.

ALCOA CHEMICALS

**For finer products . . . let Alcoa add new dimension to your creative thinking!**

"ALCOA THEATRE"
Exciting Adventure
ALTERNATE MONDAY EVENINGS

Reynolds Aluminum Pipe is typical of the line of quality major equipment distributed through National's 130 stores.

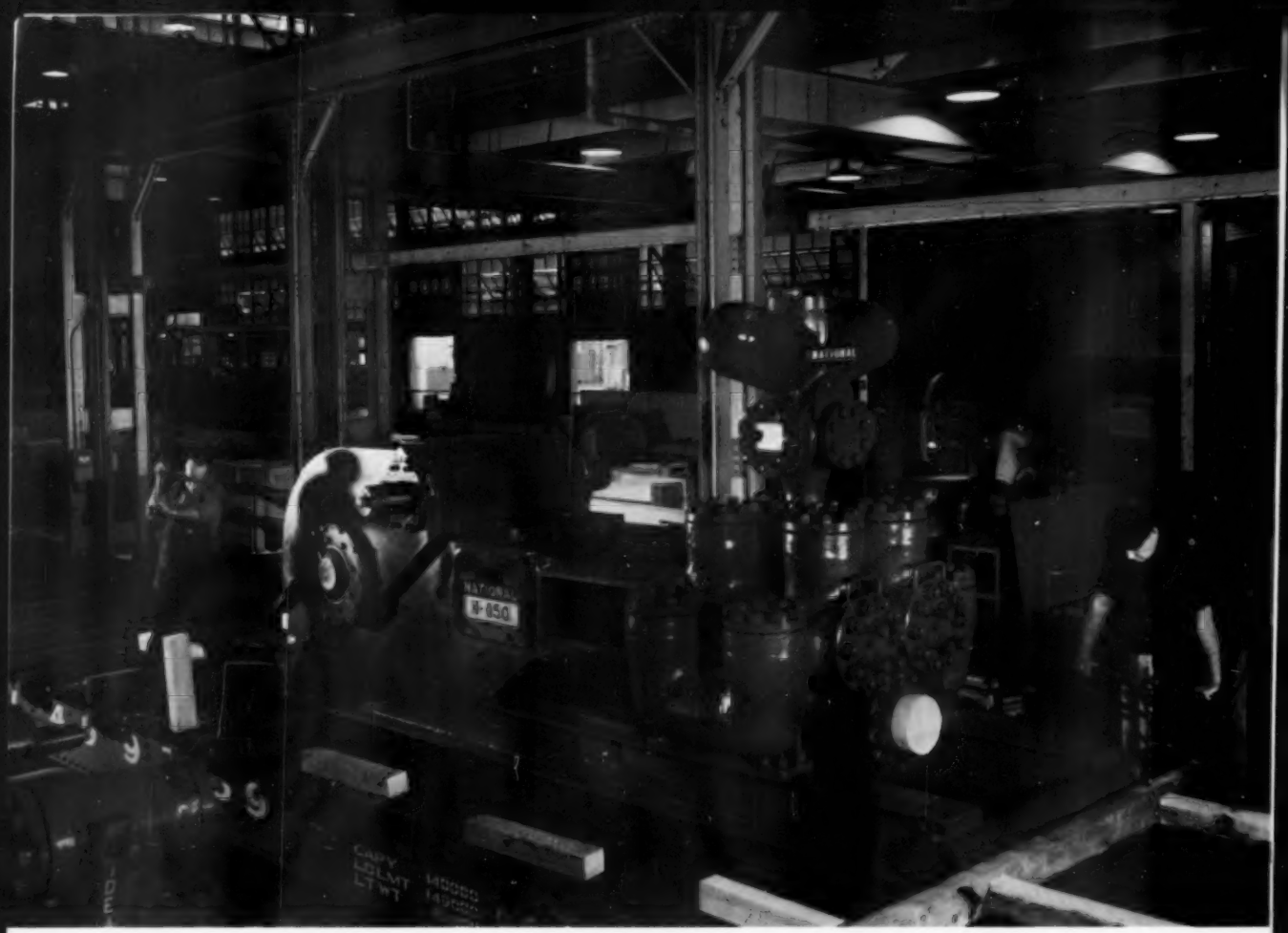
## Have you shopped here lately?

This is a view of Reynolds Aluminum Pipe stocks in the equipment yard—an especially interesting part of a National Supply Store you should see more often. You can closely inspect this pipe, Spang tubular goods and other quality products as frequently as you choose, because you're always welcome in our equipment yard area, store, warehouse or pump shop. The doors and gates are always open, and it will pay you to walk in and get better acquainted with our store people and the stocks they offer. We've built counters in the fronts of National Supply Stores for convenience—not as barriers.

As you walk back and around, you'll see products like this Reynolds Pipe, Rockwell-Nordstrom valves, Tube-Turn fittings, Ajax Engines, Oilmaster Pumps and Link-Belt Chain. The list of outstanding equipment is a long one, and we're pleased to be associated with every name on it.

More important, it's equipment we know you can use to operate profitably. Having it ready for you, when and where you need it, is our business, and we have 70 years of experience in it.

The next time you stop in a National Supply Store, shop behind the counter, too.




A new H-850 slush pump is prepared for shipment from National Supply's Toledo, Ohio, Plant. The H-850 has a rated input of 850 hp and hydrostatic test pressure of 8,000 psi in the fluid cylinder. Bore is 8" maximum and stroke is 15".

# "The new H-850 pump is designed to give longer trouble-free service, under more severe conditions, than any previous National Slush Pump, or any other comparable pump"

That's what the men who have engineered and built this streamlined new pump say about it, and they point to the features of its *uniquely designed fluid end*, as well as many other features, to back up their statement.

## More horsepower per unit of weight

The main frame is made of steel plates and steel castings electrically welded into a unit. The fluid end is a one-piece high-strength steel casting with no internal baffles or walls. Overall, these features serve to provide a pump with higher power (rated input of 850 hp), less weight and better portability.

## New packing arrangement reduces stress

Fatigue life is improved by holding and tightening the liner packing independently of the liner, so that the packing carries a load only great

enough to seal off fluid pressure. Thus, the stresses created in the cylinder bore by liner packing pressure are no greater than those created by fluid pressure alone. Moreover, the cylinder head bore is packed off at a point well in from the face of the cylinder, which nearly *cuts in half* the length of this bore exposed to fluid pressure. This reduces the stress level in the bore.

### Cylinder bore wear reduced

The liner in the H-850 is held in place metal-to-metal between the cylinder head and the shoulder in the cylinder bore. Liner movement is impossible when the cylinder heads are tightened properly.

### Liner packing life increased

The liner packing of the H-850 gives longer and trouble-free service because it is never subjected to pressure greater than that which it must seal, and the clearances that it must close remain constant and closely controlled.

### Many benefits in "dual cage fluid end arrangement"

This fluid end design permits independent adjustments of liner packing and cylinder head packing, as well as better retention of the liner. It is especially suitable for jet drilling, where operation at near rated pressure is continuous.

Independent adjustment of liner sleeves and cylinder head packing puts the full effect of any necessary tightening on the packing that is leaking. Because tightening force is not transmitted through one packing to another, there is less chance that extruded rubber will make cages hard to pull.

Smooth and highly efficient fluid flow into and out of the cylinder is insured by locked alignment of inner and outer cage openings and valve ports.

A large contact area between liner cage and cylinder head in the H-850 minimizes the possibility of material upsetting or "cold flow," which would allow the liner to loosen in service.

### New National Pulsation Dampener, too

Available as original equipment on the H-850 (and suitable for all pumps rated at 500 hp or more), the new National Pulsation Dampener completely eliminates troublesome rubber diaphragms, bags and sleeves. Only rubber element is a simple disc valve which can be easily and inexpensively replaced. This National Dampener operates on rig air supply—no supply of high pressure air or nitrogen needed for pre-charging.

### Many other features

Some other outstanding features of the new H-850 pump include: grease packed bearings for clean lubrication without strainers or gear pumps; bearing cavities which can be filled to capacity, so that if the pump is idled for long periods, moisture can't condense on and corrode bearing surfaces; tapered crosshead pins and tapered threads on piston rod connections to crosshead ends.

With all of these reliable design and operating features, it's easy to see why the H-850 can "give longer trouble-free service, under more severe conditions, than any previous National Slush Pump or any other comparable pump." Ask the National representative in your area to tell you more.

New National Pulsation Dampener is available on the H-850. Suitable for all pumps over 500 hp, this dampener contains no rubber diaphragms, bags or sleeves. It operates on, but does not deplete, rig air supply.

***National Fluid End Parts on the next page!***

# Reduce maintenance costs with National Fluid End Parts

### Dual Seal Piston

Incorporates two replaceable piston rubbers, forming an inner and outer seal at each end of the piston. Void between the rubbers allows space for displacement, minimizes damage to piston lips as it enters liner. Heavy fabric section molded into the back of inner rubber dams off extrusion around the OD of hub, and reduces pinching of the rubber. Forged steel hub of piston resists expansion under extreme loading.

### Fluid Piston Rod Packing

Fluid pressure actuates the sealing lips. The greater the pressure, the tighter the seal . . . yet the solid make-up through the body of the packing minimizes the danger of overtightening it when it is installed. Rod wear is sharply reduced, because lip pressure is never excessive . . . in fact, it is negligible on the suction stroke.

### Fluid Cylinder Liners

The ID of the Nationaloy Liner is case hardened throughout its length to a hardness of over 650 Brinell. Precision honing gives it maximum resistance to wear, washing and abrasion. Outside surface is machined to close tolerances, promoting closely controlled fits which reduce piston and rod wear due to misalignment.

### Fluid Cylinder Liner Packing

Resistant to oil, gas, heat and chemicals, National Liner Sleeves provide a perfect seal between the liner and pump bore. They are sufficiently hard to be confined in the packing space . . . preventing excessive flowing and pinching . . . yet they retain ample resiliency for proper sealing action.

### "Blue Stripe" and "Blue Chrome" Piston Rods with API Tapers

Have maximum tensile strength and high resistance to impact. Precision ground and polished to reduce wear of both packing and rod. "Blue Chrome" Piston Rods have a super-hard, abrasion-resistant chrome finish which gives added packing and rod life under all conditions.

### Type G-1 Fluid Valves and Seats

Promote maximum pump efficiency, with maximum effective opening for fluid flow to permit complete filling at high speed. The lower guide . . . integral with the valve . . . has a large contact area which reduces wear and minimizes the possibility of cocking. A heavy clamp plate and lock gives longer valve life.

*Look for the Blue and Yellow Labels at all National Supply Stores!*

## THE NATIONAL SUPPLY COMPANY

Subsidiary of Armco Steel Corporation

TWO GATEWAY CENTER, PITTSBURGH, PA.

DIVISION OFFICES: Calgary, Dallas, Denver, Houston, Toledo, Torrance, Tulsa

EXPORT: 600 Fifth Avenue, New York 20, N.Y., U.S.A.; City Wall House, Chiswell Street, London E.C.1

# PRODUCTION GUIDES

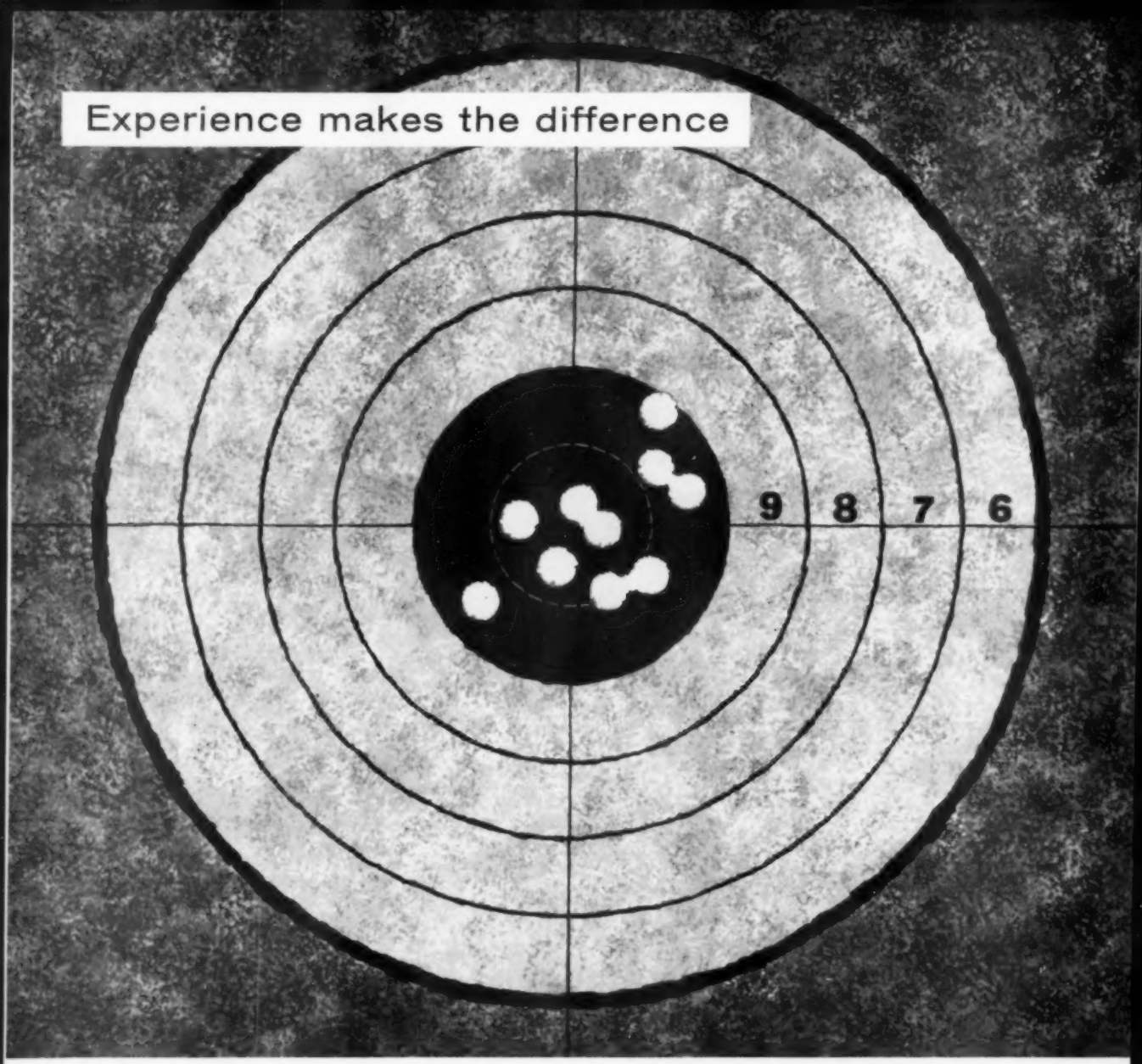
Welex Open Hole Services include every tool and service necessary for supplying the information you need in the prediction of production of your well. Coupled with the most complete line of open hole services are interpretive techniques unequalled in the oil fields of the world. These Welex-designed and engineered services and Welex-trained interpretation experts are your best guides to production:

*Electric Logging • FoRxo Logging • Guard Logging*
*Contact-Caliper Logging • Caliper Logging*
*Side Wall Coring • Dipmeter Logging • Drift Logging*

These production guides and the top-flight on-the-job service you get on every well already have earned the confidence of oil men everywhere.

## WELEX, INC.

General Offices: Fort Worth, Texas
Division offices in Denver, Houston, La Habra, Midland, New Orleans, Tulsa and Wichita. Districts in all major oil centers. Subsidiaries in Canada, Peru and Venezuela.




# Production experience puts catalysts on-target at Davison

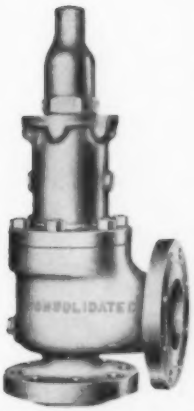
Year in and year out, carefully controlled production methods have enabled Davison to consistently produce catalysts to exacting specifications. That's one reason why Davison is the world's largest, most experienced supplier of catalysts for petroleum refining. What's more, production schedules at any one of Davison's strategically located plants are geared to give you top-quality catalysts on short notice. Give us a call!

**W.R. GRACE & CO.**
DAVISON CHEMICAL DIVISION
BALTIMORE 3, MARYLAND

**Buy DAVISON — the quality catalyst backed up by experience, research, technical assistance, service!**

# CORRUGATED SLEEVE

## shields working parts



Consolidated Safety Relief Valve with Sealing Bellows. Type 1900-30 Series, Sizes: 1½" x 2" to 8" x 10".

A durable, two-ply stainless steel Sealing Bellows in Consolidated Safety Relief Valves isolates contaminants, corrosion or viscous fluids from the working parts. The Bellows is balanced with the seating surface. Capacity is less affected by variable back pressure, so you can use smaller discharge piping and reduce the cost of pressure-relieving systems.

Full-rated relieving capacity is certain at all positions of the single blowdown adjusting ring because a fixed maximum secondary orifice provides full lift at 10% overpressure. Even with superimposed back pressure in the relieving system, valve action is consistently positive.

Protection of working parts is but one of many reasons why Bellows Type Consolidated Safety Relief Valves assure absolute protection for personnel and facilities. Write for details, including facts about the Standard valve that you can convert to the Bellows type in your own shop. Ask for Catalog 1900.

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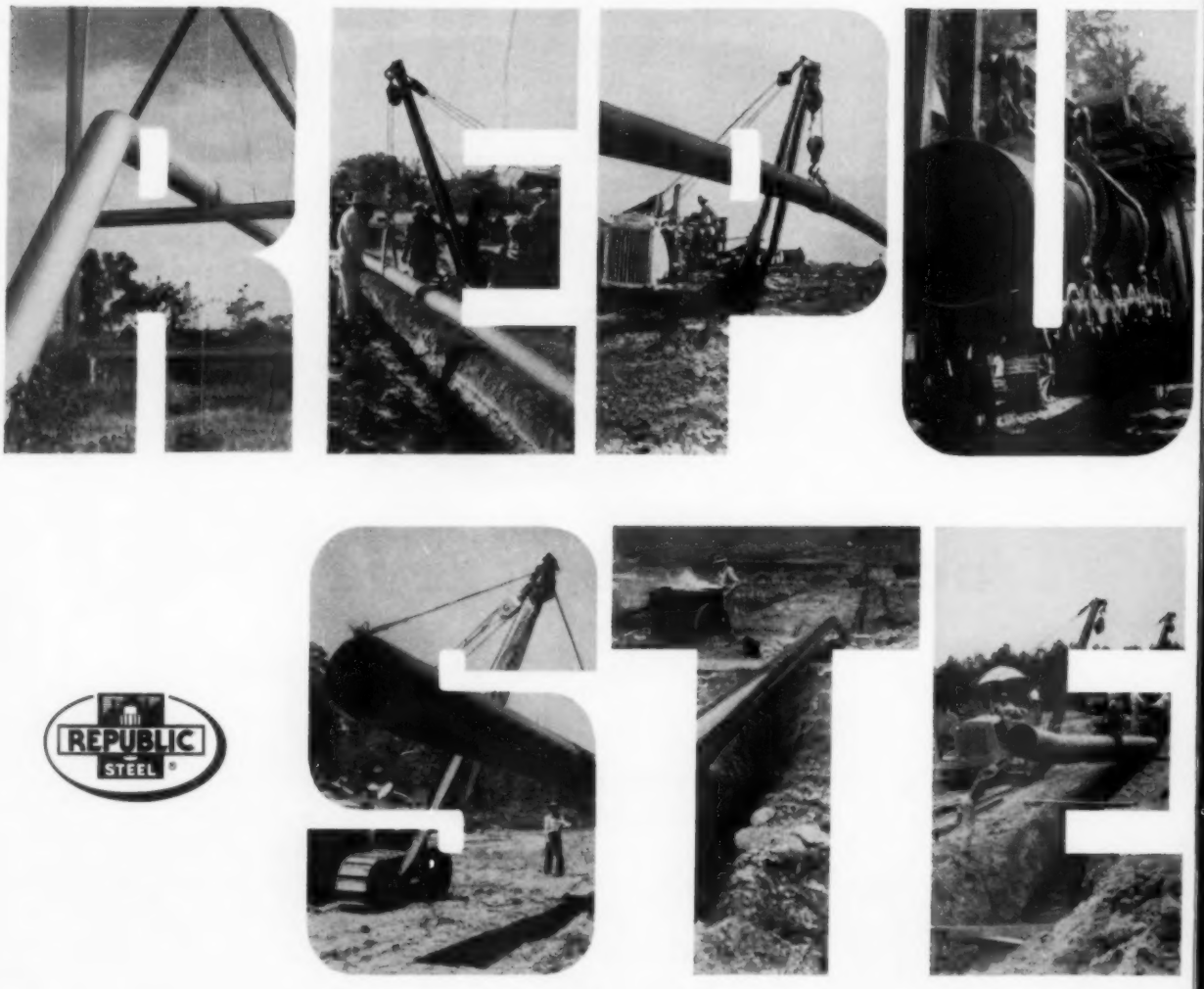
***A product of***

**MANNING, MAXWELL & MOORE, INC.**

*Consolidated Ashcroft Hancock Division • Tulsa, Oklahoma*
*In Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario*

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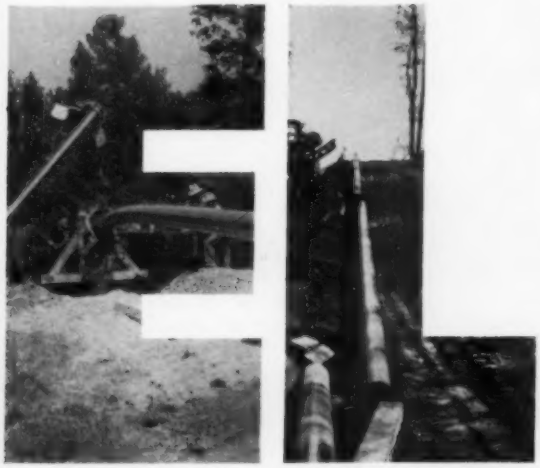
Weld Line Pipe

*Producing*

large diameter Electric Fusion
Weld Line Pipe

Electric Resistance
Weld Line Pipe

Continuous Butt Weld Steel Pipe



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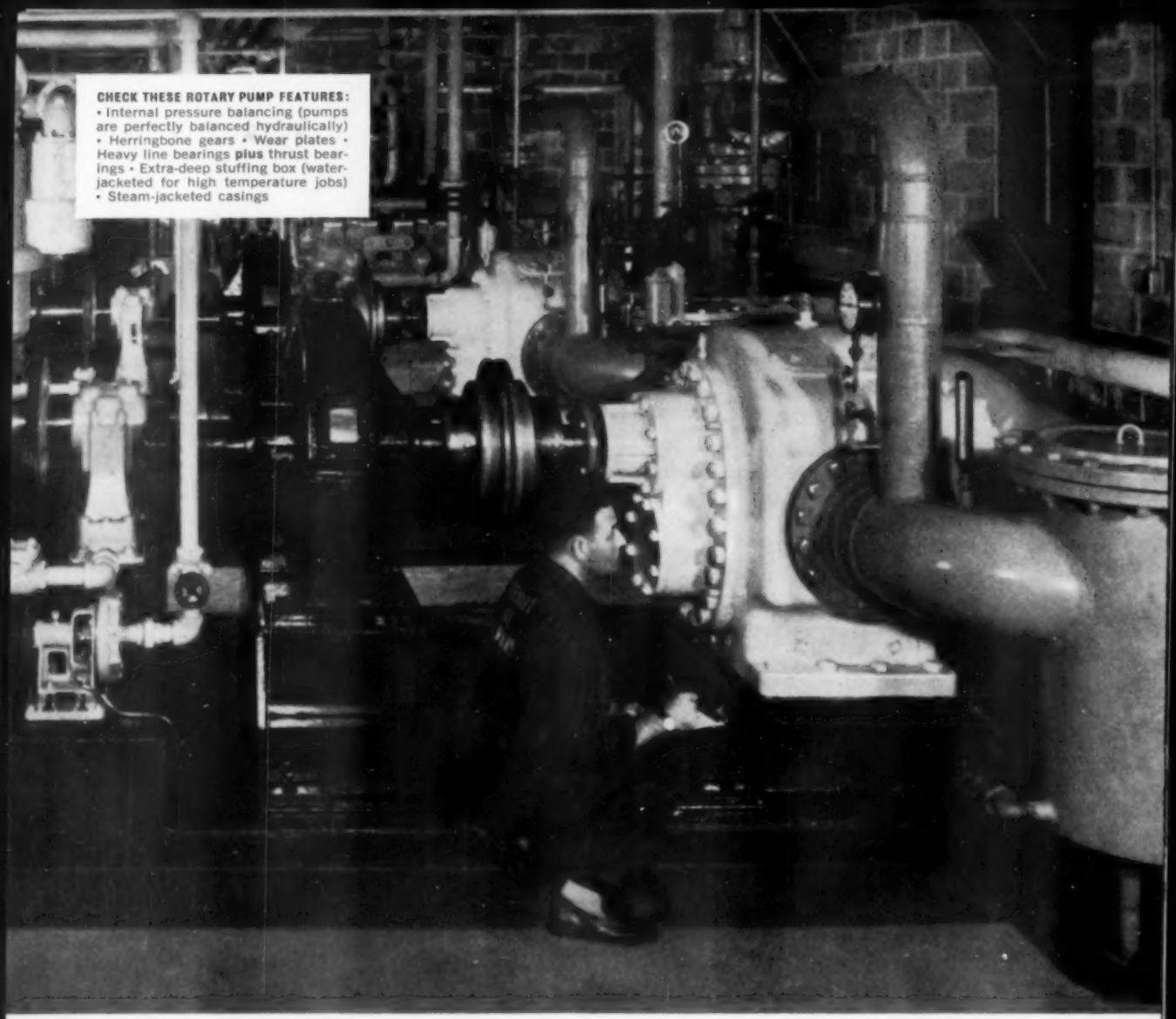
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• Internal pressure balancing (pumps are perfectly balanced hydraulically) • Herringbone gears • Wear plates • Heavy line bearings **plus** thrust bearings • Extra-deep stuffing box (water-jacketed for high temperature jobs) • Steam-jacketed casings

# THE PUMP THAT PAYS FOR ITSELF

*Greater efficiency, power savings make rotaries the pumps to use for medium and high viscosity service.*

It's true rotary pumps cost a bit more than centrifugals . . . about 25% more. But that's purchase price only. You can quickly make up this higher first cost by applying rotaries on jobs they've been designed for. Such jobs are high-capacity oil transfer in tanker loading, gathering, or tank farms. As a matter of fact, you can even save so much the rotary will pay for itself!

True? Of course. Take this typical example. On medium viscosity crude oil a centrifugal pump might have an efficiency of 50%. A rotary pump performing the same service might have an efficiency as high as 80%, thus requiring *60% less power*. And electric power saving isn't all.

Rotary pumps are self-priming, and operate under very low absolute suction pressure throughout entire viscosity range. This means rotary pumps have low required Net Positive Suction Head (NPSH). They have the same high-speed smooth flow of a centrifugal pump, too, but have positive displacement. That is, they eliminate pulsating flow. And *only Worthington* makes rotary pumps as large as 16 inch suction and discharge. Ask your nearest Worthington representative for the full rotary pump story. Or, if you prefer, write to Worthington Corpoı tion, Section 20-4, Harrison, N. J. In Canada, Worthington, Ltd., Brantford, Ontario.

WORTHINGTON

# THE ONLY LARGE HELICOPTERS FULLY PROVED IN COMMERCIAL SERVICE ARE SIKORSKYS

**HELICOPTER AIRLINES** have set many records with Sikorskys in establishing passenger service in the U. S. and abroad. The S-58 above is one of a fleet of five operated by Chicago Helicopter Airways. The line has set a record for rapid growth of a helicopter airline, carrying its 100,000th passenger within 19 months of inauguration of service.

In day in, day out scheduled passenger operations of helicopter airlines and in heavy-payload industrial service, Sikorsky helicopters—and only Sikorskys—have thoroughly proved their reliability and versatility.

Aviation maintenance experts agree that the heavy demands of scheduled airline service provide a revealing test of aircraft performance and stamina. Commercial service is proof of excellence . . . and Sikorskys have led the way in the growth of all the major scheduled helicopter airlines, both in the U. S. and in Europe.

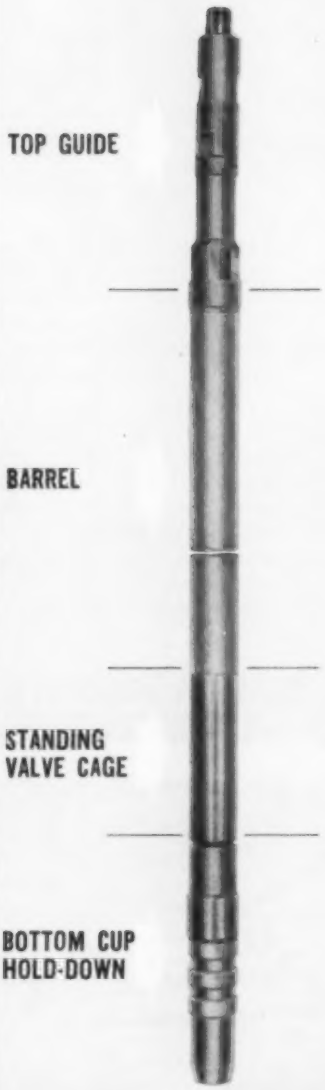
Industry too has used Sikorskys as passenger and cargo vehicles, and as flying cranes. The petroleum industry, for instance, has flown Sikorskys in the search for oil and as around-the-clock transportation to operating sites offshore, in jungles, and in other hard-to-reach areas.

Sikorskys have won a reputation for outstanding performance under difficult conditions, such as in scheduled service . . . and in the tropics, in deserts, in mountain areas, in polar regions, and at sea. If transportation is inadequate where you want to operate, Sikorsky helicopters may provide the answer to your problem. Write for information.

**SIKORSKY AIRCRAFT**
STRATFORD, CONNECTICUT
*One of the Divisions of United Aircraft Corporation*

**RUGGED AND DEPENDABLE** Sikorsky helicopters serve industry in many ways. Here an S-58 loads structural steel for flight to the mountain site of a high tension tower built by California Edison Company. Nearly 1,200,000 pounds of cargo were carried for the 68 towers erected, saving both time and the cost of road construction.

# NOW...a Pump that Positively Cannot Gas Lock!




## Field-tested for more than 3 years!

It's the REYNOLDS PUMP, with a patented universal type sleeve and seating device that completely eliminates the possibility of gas locking. It is being used on hundreds of wells handling large volumes of gas and *in no case has any well shut down because of gas locking.*

New manufacturing methods enable us to sell this pump at a greatly reduced price. You can now use this superior type pump in *regular* or problem wells without paying a high premium for the gas lock feature.

- **INTERCHANGEABLE PARTS**
- **FLOATING SLEEVE-TYPE PLUNGER**
- **FINEST HEAT-TREATED METAL THROUGHOUT**
- **VITAL PARTS CHROME PLATED**
- **LOW COST PARTS**
- **REDUCES DAMAGE CAUSED BY SAND FRAC**

*Write for complete information about this revolutionary oil well pump today!*

**Reynolds**

**OIL FIELD SALES COMPANY**

1908 S. E. 29th Street — P. O. Box 4045
Capitol Hill Station — Oklahoma City, Okla.

# They Say—

## Fiction in the Journal?

Dear Sir:

Your article ("It's Deeper Than You Think!") on page 287 of your October 6 issue presents a conclusion not at all necessary from nor even in accordance with the known subsurface data.

Give a moment's thought to the concept that the historic Phillips 1-EE University test drilled through thrusted blocks into a downwarp in front of the Central Basin Platform, and two ideas go "out-the-window."

The first is that the Sheffield Channey is a "seaway." The second is that the Ellenburger is deeper in the adjacent basins, the point of your article.

Your "deeper" concept casts the basins into a more unfavorable light. Secondly, the developments in this area are of no surprise to some of us who had mapped the basement's configuration from aeromagnetic data long ago. Yours for fact, not fiction.

Nelson C. Steenland
Geophysical Associates
International
Houston.

*(Editor's note: Geologists call theirs an inexact science. They feel that with so little ultradeep information on the Pecos area, every scrap of evidence must be considered. Mr. Steenland's opinion, therefore, is welcome.)*

## Let's show a little art

Dear Sir:

How about showing your readers some of that "sociological wildcatting" as mentioned by Henry Ralph in his October 6 column.

Although we get considerable esthetic pleasure out of Ralph's rhetoric, your other deathless prose, contour maps, formulae, and occasional outstanding artistic efforts by your advertisers; nevertheless, a peek at a few selections from the Dallas oil art exhibit would be most welcome.

Can you arrange to show us a few, perhaps as protection acreage checkerboarded with your cartoons?

Edward A. Gribi, Jr.
Bandini Petroleum Co.
Los Angeles.

## A sound depletion approach

"We are, at present, being literally beaten over the head with statistics. We have a great wealth of factual information about our industry, but we do not make effective use of it, and our critics always manage to give the appearance of knowing more about the industry than the industry does itself.

"I can't place much confidence in any program to generate half-a-million postcards to Congress with people saying 'Don't take percentage depletion away from the oil industry.'

"I can place confidence in objective, intelligent presentation of the objective, intelligent case through proper channels of communication to the decision makers of the nation. This is exactly what we have not yet done."

*Claude C. Wild, Jr., general counsel, Texas-Mid-Continent Oil and Gas Association, in a speech at the association's annual meeting.*

## Regulatory trends look bad

"The prospects for the future are dim. In Congress, since the Phillips decision, we producers have been on the offensive trying for congressional relief.

"My guess is that in the next session of Congress producers will be on the defensive instead of the offensive, and that then FPC will be seeking relief for itself. They do not like red tape any more than you do. They want to eliminate it so that they can take over and tell us how to run our business without having to go to so much trouble.

"As to the future of the courts, it is likewise dim. The general trend is toward complete control by the federal regulatory bureaus and away from interference by the courts.

"In cases before FPC and in the courts, producers must continue to fight. If we do not, in my opinion, it is simply a matter of time until FPC takes over our oil business, as well as our gas business, even without any additional laws to justify it.

*Martin A. Row, general attorney for Sun Oil Co.'s southwest division, in a speech to the Texas Mid-Continent Oil and Gas Association.*

**Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.**


American Petroleum Institute Convention
Chicago, Illinois
November 10-13

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# Up-To-Date Checklist of Dowell Acid Services–to Help You Solve Production Problems

Dowell acidized the first oil well, using inhibited hydrochloric acid, in 1932. Since then, Dowell engineers have encountered thousands of well stimulation problems where acid—properly modified and applied—proved to be the best method of increasing production. This experience has led to the development of a wide variety of improved acids, techniques and addition agents.

For example, Dowell has developed two acids with retarded action for wells producing from fast-reacting limestone pays. These acids are especially effective in vugular and oolitic formations; and in formations containing natural fractures, or exhibiting inter-crystalline porosity.

Where the producing formation is a dense slow-acting dolomite, wells often respond better to acid treatment if a Dowell intensifying agent is added.

Emulsions and silicate swelling need no longer restrict production following an acid job. Dowell has developed addition agents to combat these problems.

There is no need to rule out acid treatments if your well is producing from a sandstone. Many sands show good solubility in Mud Acid.

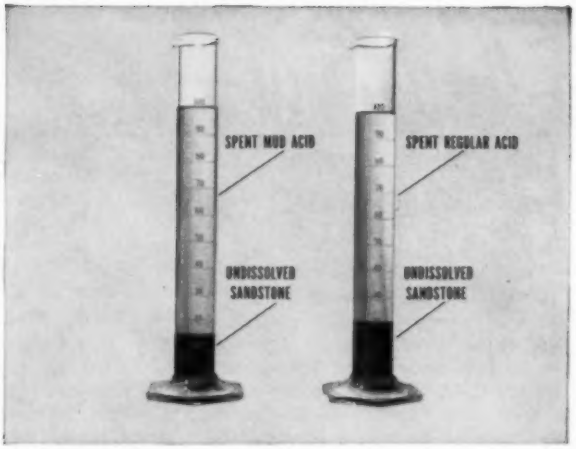
The search for improved chemicals and new acidizing techniques continues today at Dowell. Recently, Dowell worked with operators in the Mid-Continent and Permian Basin areas to perfect the use of magnesium pellets to heat acid, as the acid is pumped into producing formations. By creating heat in this manner, Dowell has been able to remove scale and deposits unaffected by other treatments.

When you specify Dowell you get the benefit of more years of experience in oil well acidizing than you can get from any other service company.

Dowell's major acid services are briefly described at the right. For service, call any of the 165 Dowell service points and offices. In Canada, contact Dowell of Canada, Ltd.; in Venezuela, contact United Oilwell Service. Or write Dowell, Tulsa 1, Oklahoma.

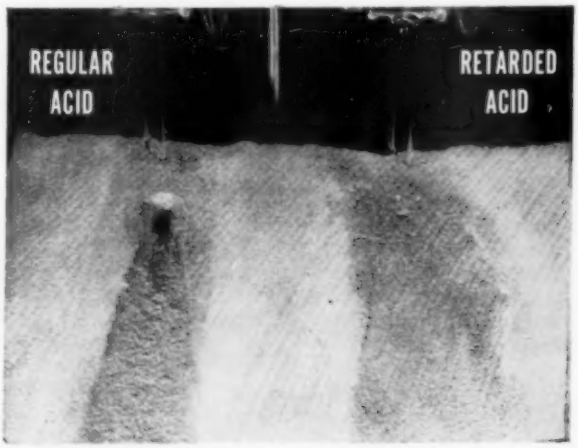
*Services for the oil industry* DOWELL

A SERVICE DIVISION OF THE DOW CHEMICAL COMPANY




**1. MUD ACID** contains a special fluoride compound designed to help dissolve and disintegrate clays and bentonites. It is recommended for use in mud removal operations and for acidizing certain sandstone formations.

**4. XFWM ACID** contains three agents designed to reduce surface tension, reduce silicate swelling and prevent emulsions. It is commonly used as a service by itself; but is also used as a spearhead with other treatments.



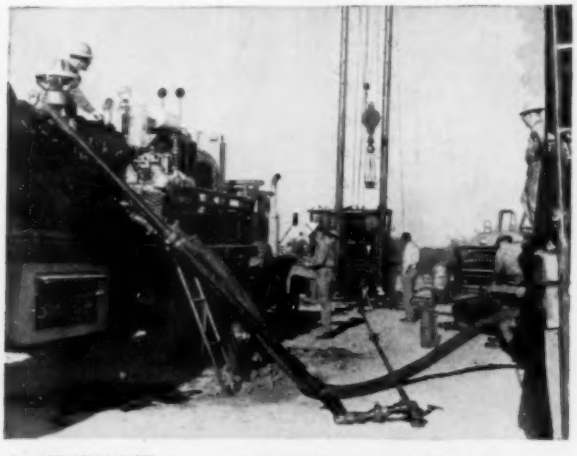

**7. RETARDED ACID** contains an addition agent that greatly slows down the acid action—as shown here. It is designed to create a deeper drainage area in fast-reacting limestone formations than does regular acid.

**2. DOWELL REGULAR ACID** is the basis for Dowell acidizing services. It is a 15 per cent by weight inhibited hydrochloric acid solution. One thousand gallons of regular Dowell acid will dissolve 10.8 cubic feet of pure limestone.

Sand Column Clean
Sand Column Plugged
BDA Acid Flowed Through Sand Column Carrying Most Of The Mud With It
Very Little Regular Acid And No Mud Passed Sand Column Due To Plugging Action Of Mud
BREAKDOWN ACID
REGULAR ACID

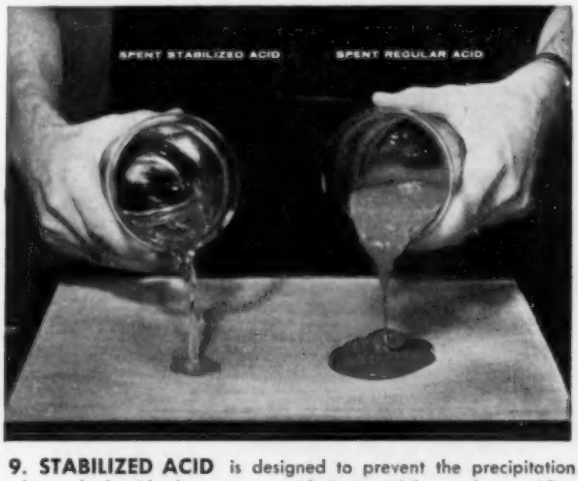
**3. BREAKDOWN ACID (BDA*)** contains agents that make it especially effective in breaking down and penetrating mud cake, and the formation. It is designed to be used as a spearhead for both fracturing and acidizing treatments.

**5. SILICATE CONTROL ACID** contains an agent designed to control the swelling of certain silicates, clays and bentonites. It is also effective in preventing or breaking oil-in-water emulsions that sometimes occur following an acid treatment.



**6. HEATBLAST** is a new Dowell service designed to remove heavy hydrocarbons and mineral scales near the well bore by increasing the bottom hole temperature of the well. It uses a jel solution carrying magnesium pellets and a specially inhibited acid.

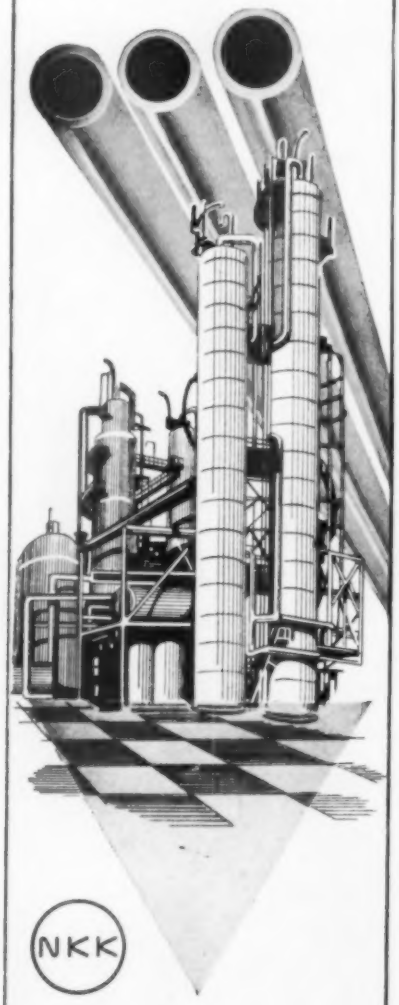
**8. ACID PETROFRAC*** is a Dowell fracturing service that uses an acid-oil emulsion as the fracturing fluid. This fluid, however, is often used on highly soluble formations—without sand—as a retarded acid.




**9. STABILIZED ACID** is designed to prevent the precipitation of iron hydroxide from spent acid. It is widely used to acidize waterflood input wells. It has also proved helpful in producing wells where iron salts are present.

*Dowell Trademark

Pipe & Tube
For Oil & Gas Industries



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**(Japan Steel & Tube Corporation)**
Ohtemachi, Chiyoda-ku, Tokyo
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# CALENDER OF EVENTS

**OCTOBER**

**26-28** Gulf Coast Association of Geological Societies, Driscoll Hotel, Corpus Christi, Tex.
**27-28** Independent Petroleum Association of America, annual meeting, Statler-Hilton Hotel, Dallas.
**26-31** American Institute of Electrical Engineers, general meeting, Pittsburgh.
**31** Natural Gasoline Association of America, Southern regional meeting, Carlton Hotel, Tyler, Tex.

**NOVEMBER**

**5-6** Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.
**6-7** American Association of Petroleum Geologists, Pacific section annual meeting, Los Angeles.
**6-7** Louisiana Polytechnic Institute. School of Engineering, seventh annual instrumentation conference, Ruston, La.
**10** Transportation Club of the Petroleum Industry, annual meeting, Bismarck Hotel, Chicago.
**10-12** American Petroleum Institute, thirty-eighth annual meeting, Conrad Hilton, Palmer House, and Congress hotels, Chicago.
**18** Chemical Institute of Canada, chemical economics subject division, meeting on "The Canadian Chemical Industry—Export and Growth," Sheraton-Mount Royal Hotel, Montreal.
**18-20** Ninth National Conference on Standards, Hotel Roosevelt, New York.
**18-20** National Conference on Air Pollution, Sheraton-Park Hotel, Washington, D. C.
**19-21** Society of Petroleum Engineers of AIME, Venezuela petroleum sections, Caracas, Venezuela.
**20-21** American Society of Civil Engineers, structural division and Kansas City section, conference on electronic computation, Kansas City.
**21** Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.
**30-Dec. 5** American Society of Mechanical Engineers, annual meeting, Statler and Sheraton-McAlpin hotels, New York.

**DECEMBER**

**1-3** Interstate Oil Compact Commission, annual meeting, Kansas City.
**2-4** Asphalt Institute, annual membership meeting, Shoreham Hotel, Washington.
**7-10** American Institute of Chemical Engineers, annual meeting, Netherland Plaza Hotel, Cincinnati.
**9-13** National Association of Corrosion Engineers, University of Illinois, biennial short course on cathodic protection.
**11-12** Mid-Continent Oil and Gas Association, annual advalorem tax forum, Hilton Hotel, Fort Worth.

**JANUARY**

**22-24** Texas Society of Professional Engineers, annual convention, Shamrock Hilton Hotel, Houston.
**23** Natural Gasoline Association of America, Oklahoma regional meeting, Biltmore Hotel, Oklahoma City.
**28-29** Annual Midwest Welding conference, sponsored by Armour Research Foundation of Illinois Institute of Technology, and American Welding Society, Chicago section, Illinois Institute of Technology, Chicago.

**FEBRUARY**

**1-6** American Society for Testing Materials, D-2 committee on petroleum products and lubricants, Sheraton-Jefferson Hotel, St. Louis.
**2-27** Southwestern Legal Foundation, short course on oil and gas law, Southwestern Legal Center, Dallas.
**9-11** American Association of Petroleum Geologists, Rocky Mountain section, ninth annual meeting, Civic Auditorium, Albuquerque, N. M.
**11-13** Southwestern Legal Foundation, tenth annual institute on the law of oil, gas, and taxation, Southwestern Legal Center, Dallas.
**15-19** American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Sir Francis Drake Hotel, San Francisco.
**16-19** American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, forty-fourth annual meeting, Memorial Auditorium, Dallas.
**24-25** University of Oklahoma, sixth geological symposium, Norman, Okla.
**27** Natural Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

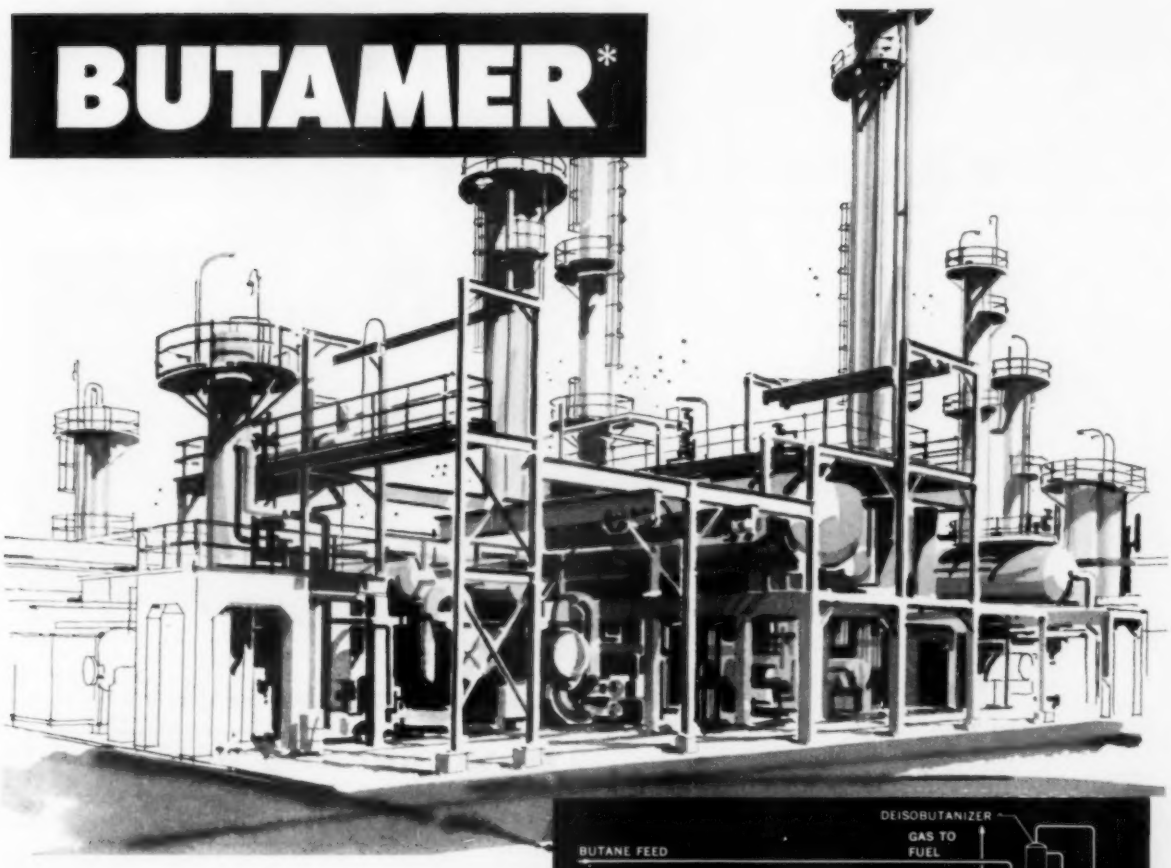
**MARCH**

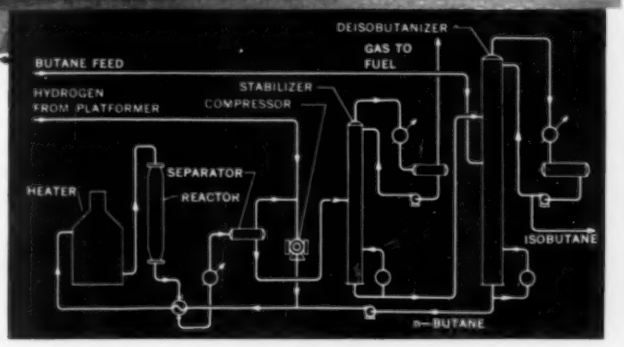
**9-11** Midwest Gas Association, annual meeting, Hotel Fort Des Moines, Des Moines.
**19-20** New England Gas Association, annual meeting, Hotel Statler, Boston.
**25-27** American Petroleum Institute, Division of Production, southern district meeting, Roosevelt Hotel, New Orleans.

**APRIL**

**2-3** Society of Petroleum Engineers of AIME, Rocky Mountain petroleum section, Casper, Wyo.
**5-10** American Society of Mechanical Engineers, nuclear congress, Cleveland Auditorium, Cleveland.
**8-10** American Petroleum Institute, Division of Production, eastern district meeting, Penn-Sheraton Hotel, Pittsburgh.
**14** Independent Oil Men's Association of New England, annual meeting, Hotel Statler, Boston.
**14-16** Southwestern Gas Measurement Short Course, University of Oklahoma, Norman.
**15-17** National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland.
**22-24** American Petroleum Institute, Division of Production, Mid-Continent district meeting, Herring Hotel, Amarillo, Tex.
**22-24** Natural Gasoline Association of America, thirty-eighth annual convention, Baker and Adolphus Hotels, Dallas.
**26-28** Texas Independent Producers and Royalty Owners Association, membership meeting, Baker Hotel, Dallas.
**30-May 1** American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

# BUTAMER*






## A new and practical process for producing isobutane

Increasing use of alkylate for blending into motor fuels gives the new Butamer process an important responsibility in supplying the much needed isobutane for alkylation plants. Butamer is a technique that provides a profitable means for isomerization of normal butane, especially as feed for alkylation processes—with which it is readily and economically integrated.

Butamer, as a key process in supplying feed for alkylation, plays an important part in refiners' move to produce a greater volume of isoparaffinic motor fuel. The need for isoparaffinic constituents, such as alkylate, in gasoline blends has been brought sharply into focus by increasing difficulty with surface ignition and its consequent "rumble."

Heart of the Butamer process is a stable and rugged platinum-containing catalyst especially developed by UOP. Capable of operating at relatively low temperatures, its use assures a sufficiently high concentration of isobutane in the reactor effluent to eliminate excessive recycle of normal butane.

Operating under hydrogen pressure, with low hydrogen-to-charge ratio, the high catalyst activity results in economical liquid hourly space velocities, thus requiring only a modest catalyst inventory. The mild operating conditions further assure minimum loss to by-products.

Butamer is one of many UOP refining and petrochemical processes made available to all refiners. A brochure describing these processes and how you may profit by their use is yours for the asking.

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B&W Welding Fittings and Forged Steel Flanges are available in carbon steel and the B&W CROLOYS.

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HARRY BECKER . . . European Representative

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# JOURNALLY SPEAKING

## Purple people

Once upon a time, there was an oil editor whose favorite crack was "The only thing wrong with the world is that it has people in it."

Now that's a rather sour philosophy. And you can well imagine the popularity of that guy. But reflect on his words for a minute. Can you picture a world **without** people in it? Who'd be running things? Insects, maybe? Or perhaps the simians?

One thing is sure. There wouldn't be any need for oil. But as things stand, there **are** people in the world. And they need oil. And to find that oil, we're sending all kinds of people overseas. And they're meeting all kinds of other people.

This widespread travel spree by oil men is going to have some profound effects. Not the least of these has to to do with education in our schools.

It's already beginning to show up. In some of our geology and engineering schools, the undergraduate is finding more and more emphasis on language and history requirements. You can look for this to expand in the future. And you can look for an increasing emphasis on the personality factor in selection of personnel by the oil operators.

In an address to one of our larger exploration societies recently, one prominent oil man put it this way: "As we train our future expatriate exploration people, we must know more and more about them and their families before we send them abroad. It will cost tens of thousands of dollars to prepare and transport a man and his family (and be assured there will be families) abroad. What profit in finding too late that the man has a supercilious and contemptuous attitude to his foreign environment, or that his wife is unhappy if she can't get home to mother every three months?"

So the employment interview of the future may well take several new turns. The prospective employe will be quizzed not only about grades, courses, and experience, but may be required to recite the Gettysburg address in Japanese. His wife may be invited in for the old once-over. And both of them may be whisked away to the nearest Dale Carnegie office before the deal is closed. They're going to have to get along with all kinds of people, even purple ones.

## Letters, we get letters

Speaking of people, there are some mighty funny ones in the world, too. And most of them seem to read the Journal.

Where they get hold of it, nobody knows. Probably in the public library. But immediately upon coming across it, they become authorities on oil. Some write us letters. We answer them. And then we file them. But sometimes it becomes a real crossfire of correspondence. Of them all, this is our favorite:

Original inquiry: "Dear Sir: My grandfather left me leases on 1,280 acres of land in Pecos County, Texas. Will you please tell me what these are worth, and if there is any wells drilling there?"

Original reply: "Dear Madam: We shall be happy to give you what information we have on drilling activity around your leases, but you failed to tell us the survey and section numbers of the land. If you will fill us in on this, we shall be glad to check it for you."

The backfire: "Dear Sir: You, of all people, should realize that the information you requested of me is strictly confidential and cannot be revealed to **anybody.** Thank you just the same."

Correspondence closed. No comment.

*Frank J. Gardner*

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# The Aneth order is a warning to all states

THE federal order to shut down most of the big Aneth field in Utah until waste of gas is stopped came as a surprise to everyone concerned. But it should not have been surprising to those familiar with the history of conservation during the past 25 years.

Early state conservation laws were rushed through to forestall the threat of federal action. For years it was a toss up whether state or federal control would be dominant. Later the states bragged that by enacting good laws they had permanently scotched the federal threat.

But Washington never surrendered its right to require conservation of oil and gas on public and Indian lands.

THIS IS CLEAR WARNING to the states that the threat of federal regulation of their oil and gas production still exists, and that it will be exercised if their own laws leave any loopholes for Washington to allege that waste is being permitted.

Utah's conservation law is deficient in several important respects. It has no effective system of proration, and does not protect correlative rights, require ratable take, nor encourage unit operation. Lacking these tools, Utah finds itself powerless to control production entirely on the basis of preventing physical underground waste without causing great inequity among producers.

Most other states containing much federal and Indian land also lack conservation laws that are completely comprehensive, modern, and effective. So they should not be surprised if Washington follows its Aneth move with similar actions within their borders.

There is considerable mystery about the motivation of the Aneth shutdown order. Possibly the matter will be settled in a short time.

But the point that should not be overlooked by the public-land states—and by all the others, too—is that the Government has latent powers over oil and gas conservation, and has a disposition to use them where it considers state regulation inadequate.

IT IS A COINCIDENCE that this sudden federal intervention in Utah comes at a time when there is a grass-roots movement among producers in many places to modernize all state laws and practices not only to prevent physical waste more adequately but also to reduce production costs.

The two events together could bring about a general revision and updating of the state systems to make certain that the federal Government can have no complaints about state control, either in its position as a landlord or as guardian of the general public interest in husbandry of a natural resource.

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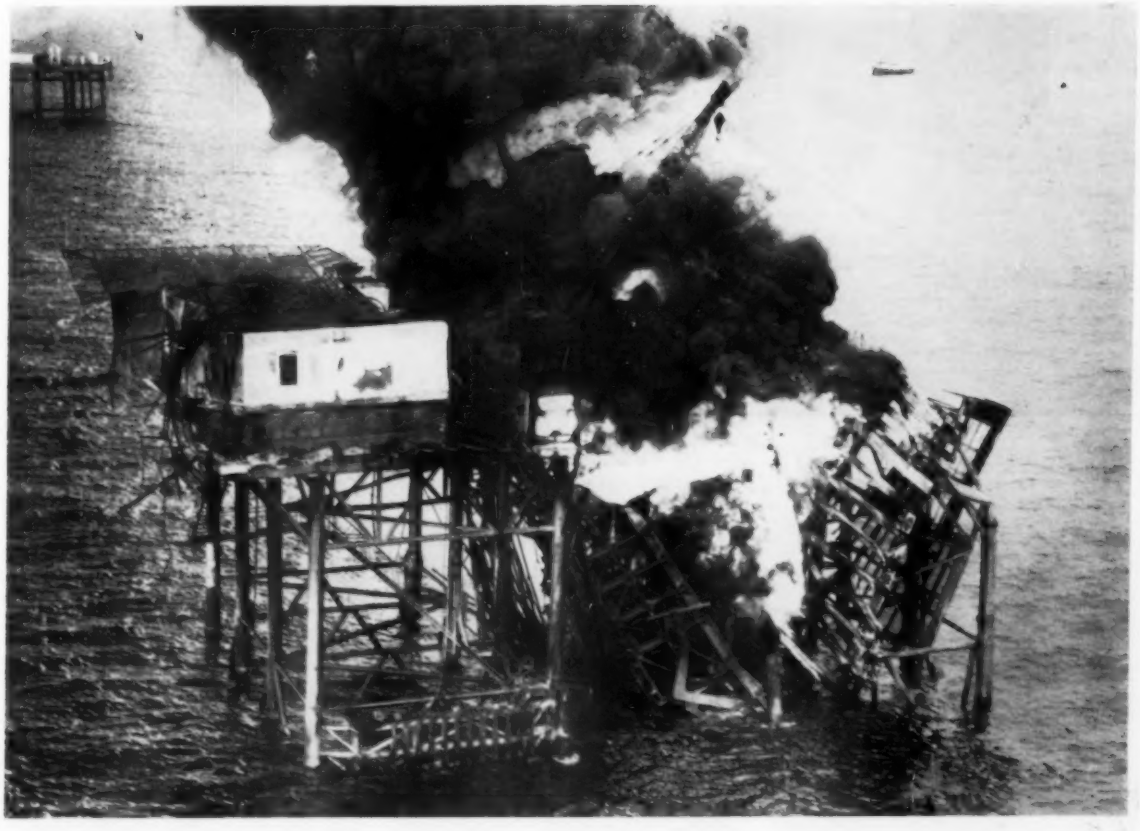


# CATC Tackles Big Well-Killing Job

• Three big rigs move in to drill relief wells, while a famous firefighter tries to shut off the flow at the surface. Cost to date: Seven lives, one platform, output of an entire field. But officials find room for optimism.

CATC'S RAGING FIRE off Louisiana has the oil industry looking hard at offshore production techniques.

The catastrophe points to the inherent dangers of multiwell platforms —particularly where the wells themselves are multiple completions.

Producers know that fires will occur, regardless of the safety precautions taken. But by jamming together on a single platform many high-cost wells, the chance they take rises astronomically. Not only are there more ways for fire to occur, but the investment in the small area is much greater.

There is little likelihood that producers will stop multiple completions because of CATC's fire. Multiple completions are economically sound.

The question is this: Will producers cut down the number of wells they complete on a single platform?

**The battle . . .** The CATC group is battling its disastrous offshore fire the hard way—by drilling to the producing formations to choke out the flames.

An emergency three-way drilling operation, costly but necessary, is under way near the burning seven-well platform.

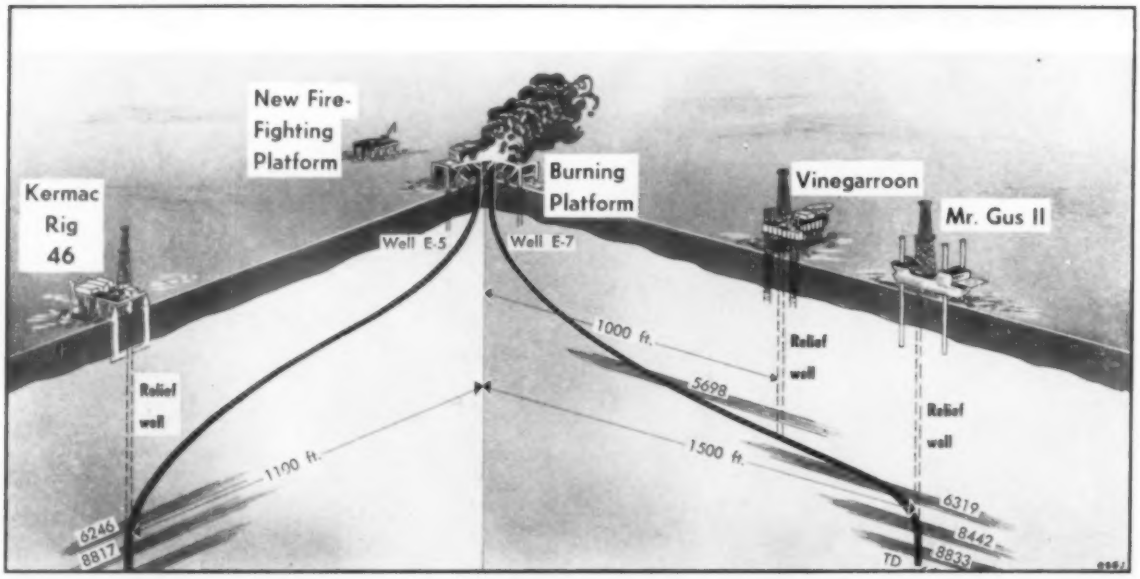
The new holes are aimed at the formations from which the wells are producing. The two wells which were still afire last week had been producing from seven formations. One was a quadruple completion and the other a triple.

**How it happened . . .** It may be many weeks before investigators decide what specifically caused the fire. They may never find out definitely.

Survivors have been questioned, but the results of the inquiry have not been released.

Virtually everyone concedes there

## How Continental Plans to Control the CATC Wild Wells




KERMAC RIG 46

VINEGARROON

MR. GUS II

was no blowout. An explosion on the platform set off the conflagration.

It is known that three operations were in progress on the platform which could have contributed to an explosion:

**. . . Drillers were completing** the platform's seventh well, a quadruple producer.

**. . . The other six wells** were producing at the time.

**. . . A welding operation** was under way, although it is uncertain whether the welder, who died in the fire, was working at the time of the explosion.

**The danger . . .** The 45-E platform, like others with many wells, contained facilities which have inherent dangers.

There were, for example, three production tanks and a separator. In addition, the oil lines from nearby platforms converged on the 45-E and surfaced at a central point before angling off to shore.

It is possible that gas could have accumulated at one or more points around the platform. A match, a cigaret, a welder's spark, a friction spark—many things could have been responsible.

**The problem . . .** CATC is fortunate that only two of the seven wells were actually burning last week.

A third well, which had burned for a time, was blowing salt water. A fourth, which had burned vigorously at first, had ceased its flow. It is uncertain whether any of the other three wells on the platform burned, but at least they were not adding to the fire last week.

The two burning wells are the E-7 and the E-5. The E-7 was being completed as the world's second four-string quadruple completion at the time of the explosion and fire. The E-5 was a triple completion which had been on production only a few months.

Continental officials were not optimistic about controlling the wild wells at the surface.

However, they brought Paul (Red) Adair of the M. M. Kinley Co. in to start work in this direction. Myron Kinley, who heads the firm, had been called to Galveston County to tackle a Phillips Petroleum Co. wild well.

**The plan . . .** CATC is placing its real hopes on relief wells drilled to kill the blowing wells from the bottom.

Two relief wells are spotted to intersect the quadruple well, and a third is spotted to intersect the triple well.

CATC is moving in three of the biggest mobile barges of the offshore

drilling fleet to sink the relief wells. Mr. Gus II, of the old C. G. Glasscock Co., was first on the scene and is set up 1,500 ft. southeast of the burning platform.

Zapata Offshore's Vinegarroon, which had been drilling for Zapata's own account off Vermilion Parish, was towed to a location 1,000 ft. southeast of the fire.

Kerr-McGee's workhorse Rig 46 was brought from a Pure Oil location off Vermilion Parish to drill a relief well from a surface location 1,100 ft. southeast of the platform.

In addition, CATC started construction of a work platform, to include two tender-type jackets with expanded metal decking, adjacent to the ill-fated "E" structure. These will serve as bases from which to fight the fire at the surface.

CATC's tender, the Ernie Miller, has been towed into the area and is tied up at a production platform nearby. It serves as headquarters for on-the-site operations.

A special fire-fighting barge has been rigged to play streams of water over the fire area to keep exposed steel cool enough for work to progress.

**The relief wells . . .** Killing the burning wells by drilling relief wells is not as difficult as it might be.

The reason is that both burning wells are directional, not vertical holes. For the most part, they were drilled by kicking them at an angle and then drilling at the angle to a point just above the producing sands. Then they were turned back to vertical and drilled into the sands.

Thus, the bottom segment of each hole, where the oil and gas enter, is vertical but is not directly under the platform. Because of this, the relief wells will be vertical and therefore faster to drill.

The relief well for the triple producer, the E-5, can intersect it just above its top sand and continue drilling vertically downward to hit all three producing zones.

The lower two sands in the quadruple producer, the E-7, are in a vertical segment of hole, but the upper sands are in an inclined portion. For that reason, there must be two relief wells for the E-7.

One relief well will intersect the E-7 just above the two lower zones and continue drilling vertically through both zones. The second well will intersect between the upper two zones but should be close enough to the perforations of both to kill them.

**Mud in annulus . . .** Another fortunate thing about the arrangement of the burning wells is that mud fills the annulus of each.

Offshore wells must have a separate tubing string for each producing zone. None may flow through the annulus between tubing and casing, and mud fills this area. This should make it easier to kill the burning wells after the relief wells have been drilled.

All the wells on the "E" platform have produced sands along with the oil. This made it impossible to use storm chokes in the tubing strings. Not only would the sand cut out the chokes, but it also would settle into the chokes and make them inoperative.

Each of the tubing wings on all the "E" wells had high-low pressure shut-in valves. Continental officials speculate that these shut-in valves may be responsible for the fact that some of the wells are not blowing.

A low pressure on the valve would inevitably result when the platform collapsed and broke the flow lines. And, this low pressure would close the shut-in valve. It is also likely that some of the strings which blew out at first have plugged up with sand.

**The cost . . .** Total loss suffered by the four CATC companies will prove monumental.

A close estimate of cost is impossible, but it will run into several million dollars.

CATC not only lost its expensive platform; it may have to abandon and redrill the seven multizone wells. Just the expense of snuffing out the fire with three emergency offshore rigs will run high.

And the gathering system for the entire Block 30 field in the West Delta area, which converged on the destroyed platform, will have to be reworked.

All wells on the other platforms are closed in. Total production loss is about 5,000 bbl. per day.

At the time of the explosion, production was being taken from 12 strings of tubing.

The seven wells, which account for about 20 completions, were spaced 7½ ft. apart in two rows. The two rows—with four wells in one and three in the other—were 10 ft. apart.

Continental Oil Co., the operator, has liability insurance up to $20 million and property damage insurance up to $50 million. The other CATC companies also have insurance. With Continental in the group are Atlantic Refining Co., Tidewater Oil Co., and Cities Service Production Co.

CATC already has plans for speedy construction of a small new platform to serve as a juncture for the flowlines. When the new platform is in place and connected with the flowlines and the pipeline to shore, all production in the field except that on the burning platform can be reopened.

The field, Block 30 of the West Delta area, has been one of CATC's best. It produces from the flank of a piercement-type salt dome.

Geology of the area, however, is complex, and correlation of the sands between widely spaced wells is difficult. For that reason, it is difficult to say whether any sand now blowing out is common to other wells.

In the triple completion the producing sands range in depth from 6,246 to 9,119 ft. In the quadruple, production comes from zones at 5,698 to 8,833 ft.

**Loss of life . . .** Seven men are presumed dead in the fire, which started October 15.

Six of the seven were employed by Nicklos Drilling Co., Houston, and the seventh by A-1 Boiler Works, Harvey, La.

The Nicklos victims were T. P. Butler and E. A. Butler, brothers, of Liberty, Miss.; B. H. Pugear, Livingston, Tex.; W. A. Simmons, Houston; G. J. Kidd, Beaumont, and A. J. Johnson, Ellinger, Tex. Only the body of T. P. Butler had been found.

The A-1 Boiler Works victim was D. J. Hogan, Harvey, La., a welder.

Of the 29 men on the platform at the time of the explosion, 16 were Nicklos employes. General Marine Corp., a catering service, had five men on the platform, the A-1 Boiler Works two men, Continental four men, and Service Construction Co. two men.

## Wild Phillips Well Bridges

A PHILLIPS Petroleum Co. wildcat gas well blew wild for 42 hours last week before bridging itself.

The 2 O'Daniel, located 12½ miles southeast of Alvin in Galveston County, Texas, blew out and caught fire after drilling below 15,000 ft.

Phillips called in fire fighter Myron Kinley for consultation but the well bridged before Kinley went into action.

The blowout caused heavy damage to the derrick and drilling and service equipment, but no one was injured. The glow from the fire column was visible at night in Galveston 20 miles away.

The blowout occurred at 8 p.m. October 20. Bridging occurred about 2 p.m. October 22.

# Mandatory Plan Studied

**. . . to enforce compliance if voluntary approach to import controls fails. Other changes also may be in the making.**

AN ENFORCEMENT plan to back up proposed new voluntary controls on crude-oil imports is being drawn up in Washington.

News of this approach to a vexing problem leaked last week as Interior Department experts sought to wind up their analysis of oil-industry comments on the program proposed last month by Capt. M. V. Carson, Jr., imports administrator (OGJ, Sept 15, p. 104).

At the same time three serious suggestions for changes in the new program cropped up. They would:

. . . **Allocate quotas** by districts, giving weight to the historical position of importers.

. . . **Give small refiners** quotas of up to 37.5% of their crude throughput.

. . . **Set quotas by country** of origin.

The question of compliance assumed major proportions this month when several big importers threatened to pull out of the voluntary program unless quota percentages were drastically revised to protect their interests.

**Still in talk stage . . .** There is no indication whether any enforcement provisions will be written into the new program.

But thinking in some quarters is said to have veered sharply to the belief that voluntary control will work no better under any new plan than it has under the present one.

Several ideas for penalizing quota violations have been suggested. One proposal that has been advanced appears to offer a ready means of assuring that imports will not exceed set limits. It would simply bar the entry of oil by an importer in excess of his quota.

The idea is explained thus:

An importer's daily quota would be extended over a 6-month period covered by the allocation schedules. If he reached the end of his quota before the end of the 6-month period, he could bring in no more oil until the schedule for the following half-year was issued.

This would put enforcement in the hands of the Customs Bureau, backed up by the Coast Guard.

**Different quotas . . .** The idea of allocating quotas by districts and giving weight to the historical position of importers has strong backing.

It was offered as a substitute for the original plan of giving all refiners quotas for a fixed proportion of their throughput.

This would serve to confine the bulk of imports to the East Coast, which historically used 85 to 90% of the foreign oil.

It involves also the granting of quotas only to small refiners who request them and calls for control of transfers. The latter would wipe out the possibility for refiners in the interior to import on the East or Gulf Coasts and trade the oil for domestic crude in their area.

**Small refiners . . .** Frederick B. Ingram, vice president of Ingram Oil & Refining Co., New Orleans, proposed the new quota approach for small refiners.

He suggested that refiners with capacity not exceeding 30,000 bbl. daily be given the 37.5% quota—11,250 bbl. daily. Larger companies—with capacity up to 112,500 bbl. daily—also would get a 11,250-bbl. quota. Those with capacity above 112,500 bbl. would be given a general 10% quota.

The higher quotas would be allowed only to companies directly processing the imported crude. Sales or exchanges without processing would be banned.

This plan would help a group of small companies "most intensely and directly affected by competition from imports," Ingram said.

The increase in allocations for small refiners would amount to only about 80,000 bbl. daily even if invoked by every company with capacity up to 112,500 bbl. located either on the coast or on the inland waterways, he said.

# Atomic Blast in Tar Sands

**. . . expected to get approval of Canadian cabinet. It will give go sign for Richfield plan to free vast store of oil.**

AN OFFICIAL of the Canadian mines department says cabinet approval is extremely likely within 3 weeks for a proposed atomic explosion to release oil from Alberta's tar sands.

Such approval would bring the proposal by Richfield Oil Corp. to the advanced planning stage.

The feeling in Ottawa is that the application will be refused only if the experiment could be construed as a nuclear weapon test contrary to any international agreement signed by Canada.

After cabinet approval, next step will be setting up a committee of experts to control and oversee the project. Members will come from the Department of Mines, Atomic Energy of Canada, Ltd., and the National Research Council. Other experts in the fields of nuclear physics and representatives of the Alberta Government also likely will be brought into the committee.

This committee would then go to work on a study of all information available on the proposal.

Richfield has already made extensive preliminary investigations on a good deal of known information. The company also hopes to get information from the U. S. Government on recent underground blasts carried out in Nevada. This information, it is considered, would be of great benefit in planning for the proposed tar-sands blast.

**Refinery technique . . .** Scientists expect that the same principles used for years in petroleum refineries would be created by a nuclear blast.

It is hoped that the heat and pressure from the blast will melt the heavy, tar-like oil in the sands enough to make it flow free of the sand and into the cavity created by the explosion.

The heat and pressure would work on the oil just like a cracking unit in a refinery to change the molecular structure of the oil and thus change the tar-like oil into lighter oils.

Answering the question of the effect of radiation, some experts believe that by planting the bomb or blasting device in shale-like rock some 400 to 500 ft. below the sands, the radiation would be absorbed within the rock. Only the heat and pressure would escape into the sands.

There is also another consideration. The blast could leave only a granite-like fusion of tar, sand, and rock.

But it is generally agreed, at this stage, that only a test will provide all the answers.

**METHANE PIONEER**, caught by a telescopic lens as it was being readied at Mobile for sea trials.

# Stakes High on First Liquid-Gas Cargo

• Former freighter converted into complex tanker is ready for shake-down runs in the gulf for pioneer voyage to England in few months. Success will open up world-wide markets for gas wasting in remote fields.

A PIONEERING voyage, long awaited by the oil and gas industry, will take place about the first of the year.

It's a trip by a former dry-cargo freighter now converted into a tanker capable of transporting liquefied natural gas. It will load at a Louisiana port and haul the gas to England.

The liquid will be gasified in England, fed into a gas-transmission system, and delivered to English factories and homes.

Three such trial trips are planned to find out two big things: Can a ship haul liquefied gas? Is such transportation economical?

If both questions are answered successfully, the result will be an increased value for gas in many fields over the world where it now is nearly worthless because of the remoteness of markets.

**The ship . . .** Fittingly enough, the ship has been renamed the "Methane Pioneer."

The vessel is jointly owned by the British Gas Council and Constock International Methane, Ltd. After several months of work at the Mobile, Ala., yards of Alabama Dry Dock & Shipbuilding Co., the ship has been converted at a cost of $4.5 million to carry the experimental cargo.

"Methane Pioneer" now will be given a series of trial runs in and around the Gulf of Mexico, expected to take about 3 months. About the first of next year, the ship will sail from Lake Charles, La., on the first 3-week leg of her 7-week maiden voyage.

The secret of the experiment then will be how well "Methane Pioneer" does its job. Special care has been taken that everything goes well.

A new container system was installed on the ship. It consists of an aluminum welded tank, jacketed with 12-in. laminated balsa wood, and then all enclosed in a steel jacket.

Five such tanks have been installed on the "Methane Pioneer," three forward and two in the aft hold. Total tank capacity is about 33,000 bbl. of liquid methane. The methane will be contained under 2 lb. of pressure.

**Big danger . . .** A leak in the tanks is the biggest peril facing the experiment.

The gas has to be cooled to minus 250° F. before it liquefies. At this temperature steel becomes brittle. That's the reason for aluminum and special insulation to prevent sharp temperature changes which expand and contract the metal walls.

Precautions also have been taken to guard against leaks. Space has been left around each tank so crewmen can watch the tanks. Special alarm systems also will detect any escaping gas. Meters have been installed in the ship's venting system to record amount of methane vaporizing.

Stand-by recycling equipment has been installed to reconvert vaporized methane to liquid form if needed. Sev-

eral other emergency actions can be taken if a major leak occurs.

The dry-cargo ship was selected for conversion because of special ballasting required. The liquid methane is extremely light. So are the aluminum containers and balsa insulation. Dry cargo ships have large double bottoms and wing tanks built into the lower sides. These may be filled either with fuel oil or sea water for ballast so the ship will trim correctly.

**The terminal ashore . . .** The "Methane Pioneer" will pick up its cargo from new facilities recently built on the Calcasieu River, 8 miles southwest of Lake Charles, La.

The gas will come from wells owned by Continental Oil Co., one of the founders of Constock along with the Chicago Stockyards Co. It will pass through liquefaction machinery and then will be stored in tanks similar to those installed aboard the ship.

When the ship reaches England, the gas will be taken by the North Thames Gas Board. Two storage tanks already have been built near the Regent Oil Co. jetty at Canvey Island, Essex.

These tanks differ slightly from those aboard ship. They have an outer steel shell and an inner aluminum container. The space between will be filled with a light volcanic ash—perlite. Both containers will be half buried, and each will hold 1,000 tons of liquid methane.

The gas will be fed into the London gas grid after being treated at the Romford gas works. It will be mixed with a gas stream consisting of coal gas manufactured at Romford and by-product gas from the Shellhaven refinery.

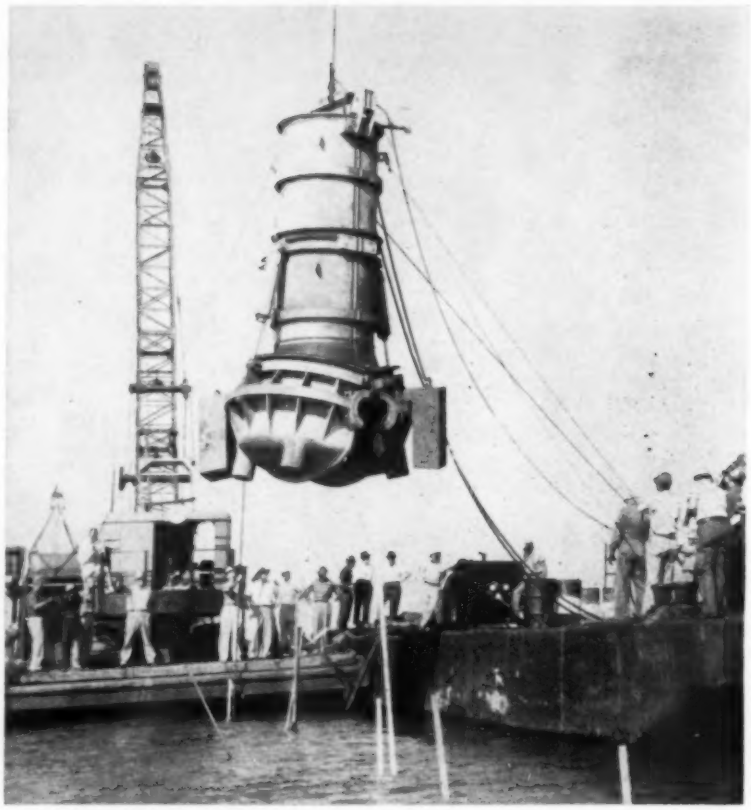
The 33,000-bbl. cargo of "Methane Pioneer" will deliver the equivalent of 115,500 M.c.f. of gas.

**The future . . .** Constock and the British expect a big industry to develop from the maiden voyage.

Constock and British Methane, Ltd., formed by Constock and the British Gas Council, believe they can sell large amounts of liquefied natural gas more cheaply than the expensive manufactured gas. They expect to get large volumes of natural gas from areas where it is in oversupply.

By 1960 Constock hopes to have a full fleet of ships shuttling to England and other European ports from this country, Venezuela, the Middle East, and possibly other areas where gas is plentiful.

The 5,000-ton "Methane Pioneer" may be tiny compared with the methane tankers of the future. If it proves successful, ships of the 30,000 to 40,000-ton class may be plying this new trade.



**UNDERWATER CAISSON** is positioned for test off Louisiana and . . .

# New Tool Joins Marine Pipe

## . . . without raising line above water. Interstate's new device is safe and economical, saves time on repairs.

ONE of the biggest headaches in marine pipelining—underwater repairs and connections—has been eased by a new caisson successfully tested by Interstate Oil Pipe Line Co.

This increasingly important operation is normally performed by raising a line above water. Or some makeshift type of caisson, generally unwieldy, is used.

The Interstate test on its 12-in. crude line in Barataria Bay, near Grand Isle, La., means a definite advance in marine pipeline maintenance and construction. The design, which is being patented, was tried first in a working scale model one-eighth of normal size (OGJ, Nov. 4, 1957, p. 98).

The original design was made by William Law, mechanical consultant for Interstate. It was perfected by Interstate and Esso Research & Engineering Co., sister companies under Standard Oil Co. (N.J.). Law originated the neoprene closure, internal hinges, and hydraulic operation which are unique with this caisson.

**Caisson in operation . . .** The initial tap and connection on the Interstate line were made in a single day.

Only a small amount of auxiliary marine equipment was required. On a recent repair job, with the pipe being raised above the water surface, Interstate had to work for several days using much more equipment.

After a repair location is staked and mud is jetted from around the line, the caisson is lowered from a barge over the line (photo). The bottom section is clamped around the pipe by hydraulic rams. Water is pumped out by a sump pump in the caisson, then repair men descend to a deck on which they may work.

Interstate describes the caisson as safe, economical, portable, and adaptable to 2 to 20-in. pipe and water up to 50 ft. deep.

**Caisson design . . .** The caisson is made of ½-in. plate with stiffeners. The bottom is 7 ft. in diameter, having a vertical split and pipe sleeves midway up the side of the split.

A top section is 5 ft. in diameter and extends up 6 ft. For deeper water, more barrel-like sections in 6 and 12-ft. lengths of the same diameter may be joined on top. The sections from bottom to top are connected by a continuous neoprene rubber sleeve which permits clamps to open and close. The hydraulic rams connect the bottom and top sections.

The caisson weighs about 16,000 lb. Two rectangular iron blocks of 3,900 lb. each were fastened to the caisson to overcome buoyancy in repairing the line in 7 ft. of water. The line was buried 11 ft. below the water surface. Up to 12 weights may be used for greater depths.

## Crude Prices Sag

### in Lower Gulf Coast region, parts of Kansas, Oklahoma.

PRODUCERS of about 71,000 bbl. daily of crude received a 10-cent per barrel price cut on the Lower Gulf Coast.

Humble Oil & Refining Co. cut the price of 27,000 bbl. daily of Sweden crude and 24,000 bbl. of Refugio light crude. The Sweden crude went to a $3.25 top for 40°-gravity, except for six fields, in which it dropped to $3.30. Refugio light crude went to $3.35.

Southern Minerals Corp., Corpus Christi, made similar cuts on 20,000 bbl. of Sweden crude. The new top is $3.25 in the Corpus Christi area and $3.20 in outlying fields.

Both companies said they posted the new prices to meet competition.

The cuts in Kansas were posted by Derby Oil Purchasing Co. and National Cooperative Refinery Association. They sliced the price in southwestern Kansas by 9 cents a barrel to a new top of $2.81 and the rest of the state by 14 cents to $3.01.

Top price is for 40°-gravity oil. Differentials are unchanged at 2 cents for oil above 44.9° gravity and from 36 to 40° gravity and 4 cents for oil 35° gravity and below.

Derby takes about 11,000 bbl. daily and National Cooperative 20,000 bbl.

In Oklahoma, meanwhile, Anderson-Prichard Oil Corp. reduced its postings for Oklahoma sweet by 14 cents a barrel to meet cuts made earlier this month by Sunray Mid-Continent, Kerr-McGee, Champlin, and Midland Cooperative. New top is $3.01 a barrel for 40-44.9° gravity, with 2-cent differential downward for oil between 36 and 40° gravity, and 3-cent differential for oil below 36° gravity.

## watching WASHINGTON

**Bertram F. Linz**

### • Gas waste is government target

THE THREAT TO CLOSE the Aneth field is a first step in an Interior Department drive to stamp out the waste of gas by government lessees, wherever it may be found.

The Utah area isn't the only one where gas is being wasted. The Geological Survey is making a study of conditions on federal leases generally. Public lands, Indian lands, and Continental Shelf operations are under scrutiny.

The department isn't expected to clamp down indiscriminately on every lessee who is flaring gas. A rule of reason will be followed. But offending operators will have to show conclusively that they can't get gas moved to market, return it to the reservoir, or otherwise use it—or face a shutdown.

No estimate has been made of the amount of production that might be halted under this policy. The department's ideas may be disclosed in more detail in a meeting with Aneth producers this week.

### • Oil and politics are mixing

INDUSTRY IS BEGINNING to raise its voice in politics. It's a rather timed voice right now. But it will be heard clearly in the 1960 presidential campaign.

The oil company that recently avowed its intention of watching the political scene—Gulf—is by no means alone. Other big oil companies are thinking about the same thing. And scores of companies across the country already are encouraging their employes to get into local politics as party workers—for either party—to learn the ropes.

A group of small business men met in Washington this month to talk over the role they could play to counter the drift toward increasing government control of industry.

Many business men have come to realize the need to protect themselves against labor's growing power in government and to counteract the suspicion of industry sown by those who would have the Government run everything.

### • Nuclear power use is in future

REFINERS SOME DAY may use nuclear fuel to produce oil products to compete with the atom. But that day is far in the future, a National Planning Association study indicates.

The study does serve to focus attention on the big industrial heating market. Manufacturing industry uses the equivalent of more than 350 million tons of coal a year to make process heat. That is double the amount used for electric power generation.

There are a few refineries which could use nuclear energy as a substitute for present fuels. And today's reactors could do the job at the relatively low temperatures required.

But refiners aren't likely to put in any hurry-up orders for reactors. Much of their fuel comes from byproduct gases. Only where a market for these gases could be developed does it appear that nuclear energy could find useful application, the NPA concluded.

A few industries could convert to nuclear power now with a slight economic or other advantage. But for the most part there is little incentive to do so.

When nuclear fuel does come into the picture the best immediate prospects will be in paper plants in high-cost fuel areas, the chemical and rubber industries, sulfur mining, and, sometime, synthetic fuels from coal.

# Turbine Pumps Great Lakes' Products

**• Pipeline men get new insight into application of this pioneer prime mover.**

DOES the gas turbine have a place as a prime mover on crude oil and products pipelines?

This is a live question in the industry. And last week the Pipe Liners Club of Tulsa heard part of the answer: The only machine of this type on a liquid line in the United States is operating successfully at Great Lakes Pipe Line Co.'s West Tulsa station.

Harold Hoyt, chief mechanical engineer for Great Lakes, recounted his company's experience this year to a group made up of engineers and executives who run many of the country's largest systems.

What he said led many to believe that the turbine is worth considering where lack of water supply, high demand charges, or other factors weigh against the internal-combustion engine or electric motor. But a cheap gas or liquid-hydrocarbon fuel must be available.

The Great Lakes installation has an 1,150-hp. Clark Mark TA turbine driving a compact single-stage double-suction Byron Jackson centrifugal pump at 6,000-6,400 r.p.m. Both are specially designed. The unit pumps 100,000 bbl. daily of gasoline, doing the same amount of work as two three-stage pumps in series driven by 800-hp. diesels at the West Tulsa station.

**Efficiency and fuel costs . . .** Interest of Pipe Liners Club members centered on the turbine's big drawback—its low thermal efficiency—generally regarded as half that of the internal-combustion engine.

Some, however, were surprised that fuel costs were not higher.

Hoyt reported that fuel costs for the turbine were less than the straight diesel but considerably more than for the modern dual-fuel engine. He said the turbine, burning natural gas at 20 cents an M.c.f., costs $3 to $3.50 for 1,000 hp.-hr. This compares with $5 for the straight diesel burning 10-cent diesel fuel and $2 for the dual-fuel engine.

Turbine efficiency varies from 16% without regeneration to 20-22% if a regenerator is added. However, the regenerator is hard to justify, Hoyt said, if fuel is cheap, because while efficiency is increased, available horsepower drops.

**GREAT LAKES' EXPERIENCE** with gas turbine is outlined by Harold Hoyt, flanked by G. P. Jennings of Phillips Pipe Line Co. (left) and W. E. Biery, Mid-Continent Pipe Line Co.

Efficiency increases as ambient temperature drops, and vice versa. The gain or loss is 0.9% per 10° F. temperature change. The Great Lakes turbine is rated at 1,150 hp. at 80° F. and 1,000 ft. elevation. At 45°, 120% of rated horsepower is available; at 0°, 150 to 160%. Peak output is available in coldest weather when a products line has its heaviest fuel-oil load. Last winter, the turbine developed up to 1,500 hp.

For each 1,000 ft. of altitude, horsepower drops 3½%.

A deterrent to development of the turbine is the severe temperatures required for efficient operation. Temperature in the combustion chamber of this particular design is 1,340° F. The chamber and rotor blades are made of special alloy steels. Improvement in metallurgy will permit still higher operating temperatures, and higher efficiencies.

# *PIPELINE BRIEFS . . .*

**A 50-mile construction** program will be finished in December by Peoples Natural Gas Co. in Pennsylvania. The final step is a 16-mile, 24-in. line between McKeesport and Gibson stations, contracted to M & R Pipeliners, Inc., Camp Hill, Pa. Peoples plans a 30-mile, 20-in. line between Bentleyville and Imperial, Pa., for completion next July.

**A 52-mile, 30-in. line** looping the Big Piney, Wyo., supply lateral will be completed October 30 by Pacific Northwest. R. H. Fulton & Co., Lubbock, Tex., is the contractor. Pacific already operates a 16-in. line from Big Piney. The expansion will permit an increase in deliveries from the field from 37,900 to 266,800 M.c.f. daily next winter.

Pacific also is laying a 12-mile, 4 to 10-in. gathering system in Big Piney, contracted to Hallmac Construction Co., and plans 12 miles of 4-in. from its main line in Klockitat County, Washington, to The Dalles, Ore.

**A 500-hp. pump station** has been completed at Dahlia, N. M., on the 296-mile, 6-in. products line from Amarillo to Albuquerque being built by West Emerald Pipe Line Corp. Sam Robertson and Guy E. Rogers Construction will complete a second

**Favorable features . . .** While fuel costs are ominous, they are overcome, in part at least, by the following advantages compared with an engine:

**. . . No cooling water required**—a big item where water is scarce. This also means no corrosion, treatment, antifreeze, or other problems associated with jacket water cooling.

**. . . Smaller building requirements** since the turbine has high horsepower output for its size and is light (10,000 lb.).

**. . . Low maintenance** — the design leaves less opportunity for wear than an engine. Both the turbine and pump are easily maintained. The pump can be taken down and reassembled in 30 minutes, Hoyt said.

**. . . Low lube-oil consumption**—almost negligible.

**. . . Ease of control**—turbine pump and compressor stations are operated remotely in this country and abroad.

**Design, operation . . .** A 20-hp. d.c. electric motor, operating on batteries, starts the turbine and brings it up to 4,000 r.p.m. At this point it is self-sustaining.

The turbine comes up to full speed in 2 minutes and can take the full line load. No warmup cycle is required.

The heated gases expand and drive the high-pressure turbine, which drives a 13-stage axial compressor providing air for cooling and combustion. The energy not absorbed in driving the compressor (about one-third of available horsepower) drives the low-pressure turbine connected to the output shaft.

Pump pressure is controlled by a pneumatic controller either on suction or discharge pressure. A signal is relayed to the hydraulic governor through an air head on the governor to control turbine speed and maintain the proper pressure.

**Eliminating bugs . . .** Hoyt reported some early trouble with vibration in shakedown runs, but nothing serious developed.

First there was vibration on the compressor end of the turbine. It turned out to be nothing worse than sympathetic vibration of the supporting steel structure, which was stiffened with concrete. Then there was vibration on the pump end. It was found to be shaft whipping because its critical speed happened to be near the operating speed. A coupling change stopped the trouble.

The compressor section is critical to dirt, Hoyt said, but a squirt of kerosine through the compressor once a week keeps it clean. Without cleaning, it may become hard to start and will not develop full power.

**Turbine applications . . .** The gas turbine is considered the oldest heat engine known, but it was not found in pipelining until 1949.

That year a unit was placed on a gas-transmission line. In the past 5 years several hundred thousand horsepower have been installed to drive centrifugal compressors.

Trans-Arabian Pipe Line last year started operating unattended gas-turbine booster stations, the first of their type on a crude line. Great Lakes is the first to use the drive to pump refined products.

Outside of pipelining, the gas turbine has had commercial application in this country since 1920. It was introduced in refining in 1936.

## Glasscock Sells

### controlling interest in two firms to Clint Murchison.

DALLAS OIL MAN Clint Murchison expanded his myriad oil holdings last week with another big purchase, this time in the offshore contract-drilling field.

Murmanill Corp., Dallas-based unit of the Murchison interests, bought control of C. G. Glasscock-Tidelands Oil Co., Inc., Corpus Christi, a pioneer offshore drilling firm, and one of the biggest.

A Murmanill official told the Journal that it had purchased "more than 70%" of the 1,200,000 shares of Glasscock-Tidelands stock outstanding at a per share price "in excess of $3.90."

By so doing, Murmanill also gets controlling interest in C. G. Glasscock Drilling Co., owned 100% by Glasscock-Tidelands.

Assets of the two Glasscock firms are reported at about $18,000,000. They include 14 rigs, all but two of them equipped for offshore work, and production in South Texas and South Louisiana.

The Glasscock companies, which started overwater drilling operations in 1949, are headed by C. G. Glasscock as president, and C. G. Glasscock, Jr., and J. C. Storm as vice presidents. Along with its Corpus Christi headquarters, the organization maintains a division office in New Orleans.

Present plans, the Murmanill spokesman said, call for the present Glasscock management to continue to run the organization. Murmanill is headed by Gerald C. Mann as president.

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500-hp. station at Tucumcari, N. M., November 15. Rogers has also installed 740-hp. and 300-hp. compressor stations on a gas-gathering line in Moore County, Texas, for Shamrock Oil & Gas, one of the owners of West Emerald.

**A modernization** program by Ohio Fuel Gas will result in construction of 55 miles of mostly 12 and 20-in. lines this fall. The projects include replacement of old lines, extensions, and connections to underground storage. Contractors are Ohio Pipe Line Construction Co. and Shamrock Construction Co.

**Natural Gas Pipeline** is building a 3,000-hp. compressor station at Mountain View, Okla., on its Bridgeport-Fritch, Tex., line. Tuloma Builders, Inc., Tulsa, the contractor, plans to complete the station by January 1. This is part of a system expansion which includes almost 500 miles of 36-in. main-line loop and connecting new gas supply in the Bridgeport and other areas.

**A new gas supply** will be connected by a 12-mile, 16-in. line which Texas Gas Transmission Corp. is laying in Jefferson Davis Parish, Louisiana. Houston Contracting Co. expects to complete the project for Texas Gas by November 1.

## *Also for Pipeliners . . .*

**IN THE NEWS:** A new caisson is making marine pipe repairs easier (p. 48) . . . First use of gas turbine on a products pipeline is reviewed for Tulsa Pipeliners (p. 50) . . . New German automatic pipeline welding process is shown off at Houston (p. 52) . . . Two Canadian surveys oppose Alberta to Montreal crude line (p. 55) . . . Transco plans another multimillion-dollar expansion (p. 55).

**PLUS THESE TECHNICAL REPORTS:** Photogrammetry, a new way to survey pipeline routes (p. 89) . . . Pipeline construction report (p. 103).

# Dr. Hans Gunther's Magic Belt — Rx

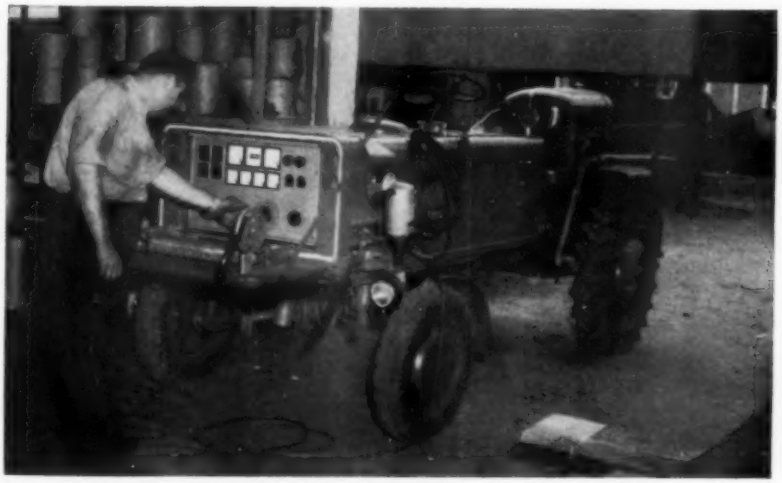
**• Process may be answer to cheap automatic welding on right-of-way.**

THE HOUSTON area last week was the first in the nation to get a look at a new welding process just imported from Germany.

Called "electromagnetic arc welding," the process is entirely automatic insofar as the arc itself is concerned. Moreover, the equipment for the process is no more expensive nor bulky than that used for conventional manual welding. Thus, it could easily be used on the pipeline right-of-way.

The process was developed by Dr. Hans Gunther of Heidelberg and has already been used in Europe to construct about 20 miles of 8 to 12-in. steam and hot-water lines. It is covered by both German and U. S. patents and may be available in this country soon. Dr. Gunther and his equipment were brought to this country by Earl Allen, Houston pipeline contractor. And, last week, Dr. Gunther and Allen demonstrated the new process at the Houston yard of Crutcher-Rolfs-Cummings, Inc.

Allen said arrangements are being made for the manufacture of equipment and its sale or rental in this country. He did not estimate how long it would be before it would be ready for actual use in pipeline construction.



**1. New welding machine,** which resembles an oversized farm tractor, drives the generators to power the various steps in Gunther's welding process.

**3. Lining up** with external lineup clamp while stringer bead is run.

**4. The rod** is bent into a circular arc, lying flat in bevel.

**Tractor-welder . . .** Dr. Gunther's welding machine is almost as unusual to an American pipeliner as is his welding process.

The tractor engine not only turns the tractor wheels, it also drives a 15-KVA single-phase a.c. generator which is the source of the welding current. And, the engine drives a 5-KVA 3-phase a.c. generator which supplies electric power to the magnetic belt and to all of the hand tools and other auxiliaries about the machine.

**Uses magnets, a.c. . . .** The new welding method is a true arc-welding technique.

The rod used is coated but there is no shielding of the arc. However, instead of the direct-current common to manual welding, the process uses alternating current to place the weld metal. An electromagnetic field directs the flow of welding current, hence the title, "electromagnetic arc welding."

Instead of being held perpendicular to the work, the rod lies in the bevel. So, it must be bent into the exact shape of the weld contour. The rod is held in place by a belt. This same belt furnishes the electromagnetic field that makes the process possible. Actual sources of the magnetic field are small, series-connected electromagnets fastened in line around the flexible belt.

Since the welding rod actually lies in the bevel, its coating must be a good electric insulator to prevent arcing between the pipe and the rod while welding is in progress. The arc is struck at one end of the rod and progresses normally to the other end. As the arc consumes the rod, it gradually melts back the coating to provide a flux. When the arc reaches the end of the rod, the weld machine shuts off automatically, leaving only a fraction of an inch of the rod unused.

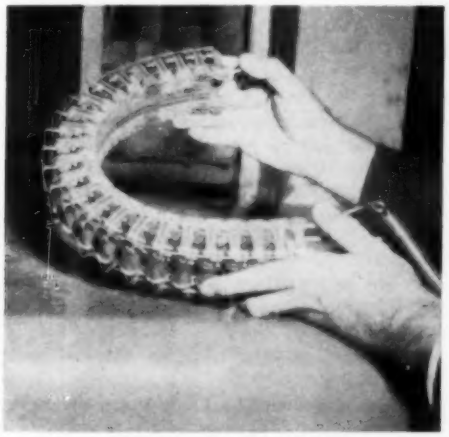
The only hand operations in this process are placing the rod in the bevel, placing the magnetic belt over it, and striking the arc.

**Bevel and grind . . .** Dr. Gunther does not use a conventional pipe-end bevel for his process. Instead, the end of each joint must be re-beveled so that when two joints are clamped up for welding, the mating bevels form a U-shaped groove.

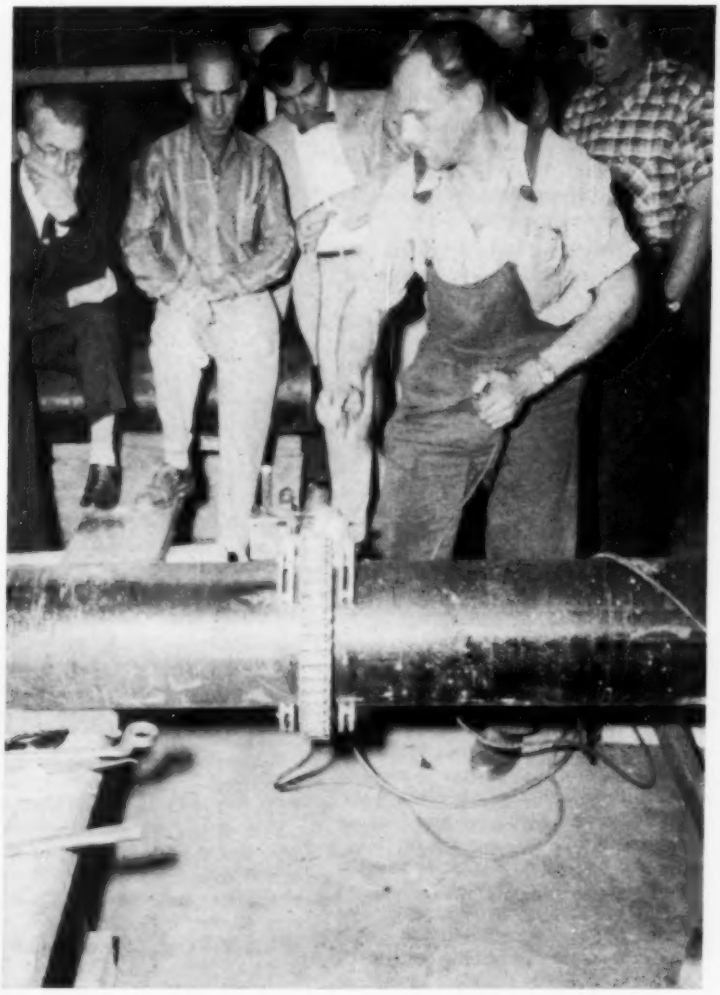
Currently, this special bevel must be cut on the job. But if the electromagnetic arc process should become common, the bevel likely could be applied at the pipe mill.

# for Pipeline Welding?

**2.** **Beveling** machine cuts a U-shaped instead of a V-shaped groove on pipe ends.



**5.** **Flexible belt** is series of electromagnets energized during welding.



**6.** **Welding** is automatic, with the belt holding the welding rod in place in the bevel. Rate of melting is comparable to manual welding.

To apply the special bevel, Dr. Gunther uses an electrically driven cutter that he says is common in European pipe-laying operations. This machine is driven off the same engine that drives the welding generator.

To make a continuous weld, each welding rod must overlap the one before. This makes a buildup of weld metal in the overlap area. And, to prevent such a buildup, the overlaps are ground down by hand before another pass is made over that area.

Lineup and spacing is important with the new electromagnetic welding process. In last week's demonstrations, an external line-up clamp was used. But Dr. Gunther reports that his company has developed an electrically driven internal line-up clamp which can be used. Spacers

**INVENTOR** of the welding process, Dr. Hans Gunther, left, discusses the method with Earl Allen, Houston pipeline contractor who is promoting it in U. S.

are used between the ends of the joints to run the stringer bead.

After the stringer bead is run, no line-up clamp is needed. And, no internal back-up is necessary. The magnetic belt is simply snapped around the pipe and the filler and cover passes run.

It is entirely possible to use the electromagnetic arc for filler and cover passes after the stringer bead has been run manually. Or, the other passes can be run manually over an electromagnetically run stringer.

The diameter of the rod, of course, determines just how much weld metal is deposited for each running inch of weld. Large diameter rods leave more metal and make fewer passes necessary. Smaller rods mean more passes.

**Two operators required . . .** Only two men are needed to weld pipe with the new process—one to handle the belt, the other to control the machine. The German machine is built into a rubber-tired tractor so that a third man likely would be used to drive the machine.

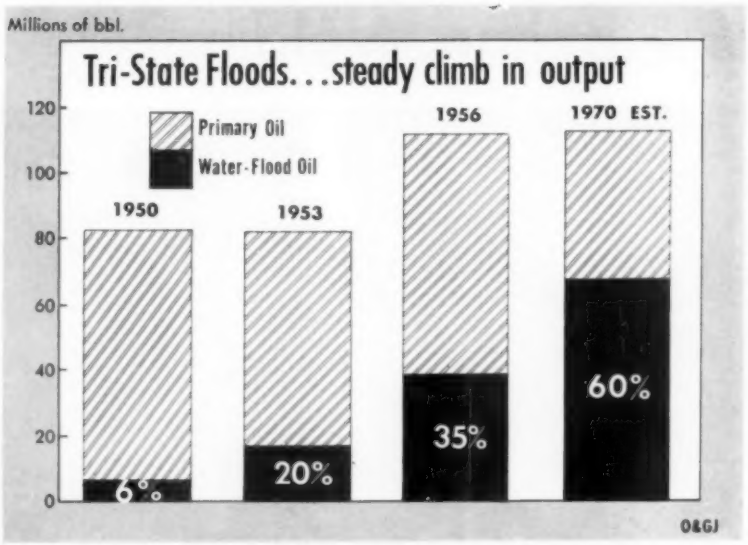
According to Dr. Gunther, there's nothing to prevent use of several arcs simultaneously from the same machine and on the same joint. And, he says, the two operators could handle as many as four arcs as easily as they handle one.

In practice, this would mean that up to four belts would be run to a single weld on big-inch pipe. Because welding can be downhill only and because the rods can be no longer than 15-in., two arcs would be struck at the top of the weld—at 12 o'clock on the pipe. One arc would weld clockwise down to 3 o'clock; the other would weld counterclockwise down to 9. A third arc would start at 3 o'clock and weld down to 6; the fourth would start at 9 and weld to 6.

Rate of burning of the arc is about the same as with manual welding. So, the net result would be roughly equivalent to having four welders at work simultaneously on the same weld.

Dr. Gunther says that his company has made all conventional tests of the magnetic-arc welds. And, he says, the automatically made weld is comparable to those made manually on pressure pipelines. He adds that welds can be made even when a strong wind is blowing. In European tests, a common manilla rope was wrapped around the pipe next to the magnetic belt in order to shield the arc from the wind.

Dr. Gunther says the magnetic field directs the welding current into the bevel so well that root penetration of the weld is always superior to that with manual welding.




# Water-Flood Oil Is Growing

## . . . in Illinois-Kentucky-Indiana area. It's expected to reach 60% of total output in little more than 10 years.

WATER FLOODING has shown a terrific growth in the Tri-state area in 7 short years. Everything points to a continuing increase.

Recoveries from water floods in the three states jumped from 6% to 35% of total production during that period.

That makes the area first in water-flood production, in terms of the per cent of total production. It is second in volume only to the Texas-Oklahoma-Kansas region.

This is shown in studies just completed by Albert E. Sweeney, Jr., director of technical services for the Interstate Oil Compact Commission.

The surveys cover the Tri-state area from 1950, shortly after water flooding got under way there, up to January 1957. The latest reports were completed just recently and have not yet been published.

**Future picture . . .** Sweeney's prediction for the area:

**. . . Total production** will remain relatively stable through the next 10 to 15 years.

**. . . By then, water flooding** will account for 60% of the total.

**. . . Water-flood production** may eventually reach 90 or 95% of the total production.

The estimated ultimate recovery of water-flood oil in the area is 600,000,000 bbl. The three states already have recovered 167,000,000 bbl. of that.

Sweeney previously predicted a steadily rising water-flood trend for all the nation's oil-producing areas (OGJ, March 26, 1956, p. 72).

He estimated that water-flood production would increase from 5% of total production at that time to 25% of a peak United States production of 3 billion barrels annually in 1980. He said production will then decline to about 100 million barrels by 2035, with water flooding accounting for 60% of that.

**Past production . . .** The rising water-flood trend is shown in production figures for the 3 years chosen for the surveys of the three states.

In 1950 a total of 56 projects accounted for 5,000,000 bbl. (6%) of the 83,400,000-bbl. total production.

By the end of 1953 there were 263 floods producing 17,000,000 bbl. (20%) of the total production of 82,900,000 bbl.

By January 1957, there were 350 controlled water-flood projects (not counting a number of dump floods in Illinois). These accounted for 39,800,000 bbl. (35%) of the 111,800,000-bbl. total production.

As a comparison, the Texas-Oklahoma-Kansas area had 330 floods operating in 1950. They produced 18,115,000 bbl. (1.4%) of the 1,281,000,000-bbl. total production.

By January 1957 the projects totaled 1,055, accounting for 85,600,000 bbl. (6%) of the total production of 1,422,000,000 bbl.

# Transco Plans Third Loop

## . . . to parallel main lines to East. First phase of new program would increase capacity by 90,000 M.c.f.

TRANSCONTINENTAL Gas Pipe Line Corp., now involved in the largest expansion program in its history, is preparing for further expansion of its transmission system next year.

The company filed with the Federal Power Commission last week for a certificate authorizing $51 million of new construction to be completed by November 1959.

E. Clyde McGraw, Transco president, said the project would be the first in a long-range program to build a third pipeline parallel to the other two in the company's system. The main lines extend from Gulf Coast producing areas to the New York City-New Jersey-Phildelphia markets.

Transco recently started a major construction program which will cost an estimated $167 million (OGJ, Sept. 15, p. 110). This is the largest construction program in the industry this year.

McGraw said more than half of this project will be completed by the end of this year, permitting Transco to meet its commitments for increased deliveries of natural gas this winter.

The current project will complete looping of Transco's original main line all the way from the Gulf Coast producing region to the New York metropolitan area. It also will increase the system's peak-day delivery capacity by about 40%, to 1,531,000 M.c.f.

**The new proposal . . .** Next year's proposed expansion would add another 90,000 M.c.f. per day to the capacity.

The Transco proposal would permit an increase of 82,000 M.c.f. per day in allocations to 43 customers. The remaining 8,000 M.c.f. per day of additional gas would be transported for Sun Oil Co. Transco now moves 20,000 M.c.f. of firm gas per day to Sun's Marcus Hook, Pa., refinery.

With completion of the proposed 1959 expansion Transco would increase the daily allocated capacity to 1,281,000 M.c.f., exclusive of storage, and to 1,621,000 M.c.f. including gas from storage facilities.

The application covers 149 miles of 36-in. main-line loops which are to be built in seven segments from Louisiana into Georgia. Also included in the proposal are two gathering lines of 20 and 24-in. diameter. The 20-in. would be laid from Vermilion Block 76 off the coast of Louisiana to Cow Island junction near the shore line, a distance of 21 miles. The 24-in. line would be a 13-mile loop of an existing purchase lateral in South Louisiana.

Other proposed facilities are two new compressor stations, one in Nueces County, Texas, and the other in St. Helena Parish, Louisiana. In addition, Transco plans to install extra compressors at 8 of its 25 existing main-line stations.

# Pipeline Opposed

## in new government surveys on proposed Alberta outlet.

NEW OPPOSITION to a crude line from Alberta to Montreal has reportedly cropped up as a result of two surveys by the Canadian Government.

Reports based on the surveys will probably never be made public, but the government will study them in conjunction with the interim report of the Borden Commission on Energy due late this month.

The surveys were conducted by Canada's federal department of trade and commerce and are believed to have been turned over to Trade Minister Gordon Churchill.

The pipeline is proposed by a group of independent oil producers and is backed by other independents (OGJ, July 14, p. 64). The plan is strongly opposed by major companies.

Regardless of what the Borden Commission recommends, the reports of the two government surveys likely will have a profound effect on the government's decision.

The proposed big-inch line would require government backing and would move western Canadian crude to a market which is now served mostly by South American crude.

# *INDUSTRY BRIEFS . . .*

**Two rigs** and other drilling equipment of Mercury Drilling Co. have been sold to Calvert Drilling, Inc. Both rigs are rated at 12,000 ft. and give Calvert 16 rigs. The deal also included Mercury's yard and warehouse at Lindsay, Okla. Terms of the deal were not disclosed by the two Tulsa firms. Mercury will continue its producing activity.

**Republic Steel Corp.** is rounding out negotiations to reacquire Republic Supply Co., Oklahoma City. The supply firm was sold by Republic Steel in 1948 to a group headed by Sen. Robert S. Kerr of Oklahoma and D. A. McGee, officials of Kerr-McGee Oil Industries, Inc. Republic Steel President T. F. Patton said the steel company has increased its capacity considerably in the past 10 years and has become a much larger producer of oil-country tubular goods. Republic Supply operates 45 stores and 12 sales offices in the Mid-Continent area. Since 1948, the Kerr-McGee group has continued to distribute Republic Steel products.

**Gas-separation facilities** and a pressure-maintenance project are nearing completion at Shoats Creek field in Beauregard Parish, Louisiana. Sunray Mid-Continent, operator, said liquids production will be 700 bbl. daily when operations start early next month. The project is expected to boost ultimate recovery of liquids from 1,000,000 bbl. to 4,000,000 bbl. Gas recovery will be increased from 10,400,000 to 12,000,000 M.c.f.

**American Hydrocarbon Corp.,** Dallas, last week reportedly paid more than $500,000 for 18 oilers in the DeLong field area of northern Stephens County, West Central Texas. Seller was Stephens Oil & Gas Corp., Lubbock, headed by I. A. Stephens. Charles R. Unsworth, president of American Hydrocarbons, said the purchase includes 420 gross acres of DeLong leases producing from the Marble Falls conglomerate and Mississippian lime.

**A petroleum - marketing program** will be offered at the University of Tulsa next semester. The curriculum is the first of its kind and will lead to degrees of bachelor of science in business administration and master of business administration. Seven oil companies are supporting the program by offering jobs to students to help pay their way through school.

# Energy Conference Takes Long Look at

## 1. Space Age Will Need Oil

**. . . and petrochemicals because fuels of the future will be linked to petroleum. Market for brains still big.**

E. V. Murphree

THIS resume of oil's future role was given by E. V. Murphree, president of Esso Research & Engineering Co., in an address before the second national energy resources conference in Denver.

More than 200 conference delegates from over the world heard an imposing array of experts discuss all aspects of the nation's future energy needs and sources.

Murphree reminded the delegates that petroleum and chemicals already have figured prominently in the fuels required to power rockets and missiles.

He predicted that they will likewise play vital roles in fueling space ships and other high-performance astronautic and aeronautic craft.

"It appears that for purely military purposes, such as long-range missiles, solid propellants will probably displace liquids," Murphree said.

"In a program for outer space travel, however, it is anticipated that liquids will continue to play a very important, if not predominant, role."

Petroleum will continue to be the main raw material for liquids most suitable for rocket power—carbon-hydrogen and carbon-nitrogen-hydrogen compounds, he said. Carbon-hydrogen compounds are basic to petroleum, and nitrogen can be produced essentially through petrochemical-derived ammonia, Murphree said.

Solid propellants draw even more heavily upon the basic technology of the petrochemical industry.

"This is because these materials require the presence of an elastomeric polymer for cohesion of the propellant mass," the Esso official said. "The petrochemical industry is very familiar with elastomers and has actually pioneered in this area. Of course, much of the information in this field is classified and cannot be discussed in detail."

Murphree cautioned the scientists that continued growth in the petroleum and petrochemical industries will depend on the availability of suitable manpower.

"Well trained scientists and engineers must be obtainable and must be used," he stressed.

"And more of them are needed every year. This points, therefore, to the very great need for all of us to give increased attention to the improvement of education."

## 2. Atomic Energy Will Boom

**. . . at turn of century when fossil fuels start failing to satisfy the world's enormous demands for new energy.**

Dr. C. C. Furnas

DR. C. C. FURNAS, chancellor of the University of Buffalo, says it's fortunate that man began using nuclear energy in the mid-twentieth century despite its horribly destructive debut.

"Otherwise, there would have been little chance of meeting the energy demands of the surging population by the year 2000."

Furnas paints this long-range picture for world energy:

. . . **Demands** in America and over the world will rise dramatically—probably 50-fold within a century and from 5 to 10-fold in 25 years.

. . . **World population** gains will be part of the cause.

By the year 2050 the world's population will be at least 6 billions and may be as great as 8 billions, compared to the present 2½ billions. Population of the United States during this century will increase from 175 million now to 375 million.

. . . **Per capita consumption** of energy also will increase, compounding the demand rise. Spread of technology and industrial development over the world will assure this rise in consumption.

. . . **Fossil fuels**—coal, oil and gas, oil shale, and tar sands—will not be able to meet the demand expected by the year 2000. They may be reserved for specialized uses with solar and nuclear energy doing the workhorse jobs.

Furnas declares if the current rates of usage would continue there is enough recoverable fossil fuel to supply the world 272 years and the U. S. for 100 years. Trouble is, however, the rates of energy use will increase so great that the fossil fuels won't cover the need.

**Solar energy** . . . The sun drops about

# Future Needs, Predicts:

30,000 times as much energy on the earth's surface as the human race utilizes.

But the sun as an energy source has two drawbacks: It is at a very low potential, and it is intermittent.

Furnas says the sun will not be a significant new source of energy until "the problem of controlled, efficient photosynthesis in nonbiological systems is solved."

**Nuclear energy . . .** Use of nuclear energy will increase rapidly in the years ahead, Furnas thinks.

"It will be just in time to prevent critical shortages in various parts of the world," he says.

Furnas warns that a great amount of research and development work remains to be done before nuclear energy becomes economical. Engineering work is needed to optimize fission reactor design and reduce costs of construction and fuel handling.

Another coming source of nuclear energy is the controlled fusion reaction of deuterium. Furnas predicts a practical method of controlling nuclear fusion will be found within a decade and practical, stationary fusion power plants will be built within 20 years.

The essential raw material for these fusion plants is present in all water which gives an infinite supply. One drawback: The plants probably will be very large, producing enormous amounts of power, and will be practical only in centralized locations. This will make fission plants more practical in remote and isolated areas.

**Action now . . .** Furnas says it's not too early to begin pushing these new energy developments in America.

Some other countries already face serious energy shortages, and the time is critical. This nation should have the technology ready when the energy need arises.

The upshot, according to Furnas, is that a tremendous new market for research and engineering skills and equipment will soon open up for those who are prepared to take advantage of it.

# 3. Sun Can Play a Vital Role

## . . . in meeting the strain. But its specific uses still depend on solving some problems in chemical reactions.

IF CONVENTIONAL energy resources become scarce, here's a handy way to relieve the distress: Use the sun's rays for residential heating and air conditioning.

One-fourth of the nation's total energy output now is used for these purposes, according to Dr. George O. G. Lof, a member of the research staff of Resources for the Future.

Dr. Lof said that air-conditioning equipment powered by the sun would be unusually effective because in the summer—when air conditioning is needed—the sun also is at its maximum intensity.

"All that's needed to use the sun's energy is a surface with which to intercept its rays and convert them to energy. Every landowner is a sun owner," he said.

Solar-powered equipment already being manufactured includes water heaters, batteries, outdoor cookers, and novelties, including a solar cigaret lighter.

In addition, six dwellings in the United States are now heated by solar energy, including the solar energy consultant's own Denver home.

Dr. Lof predicted early development of practical solar refrigerators, water pumps and water distillation equipment.

He also forecast that in the future public utilities will be created to convert the sun's rays to electrical energy and transmit it to consumers.

Commercial electricity from solar energy right now, he said, appears to be limited primarily by costs.

The efficient capture and storage of solar energy by means of reversible chemical reactions, on the other hand, has not yet been achieved because of technical problems.

"The rate of development of solar energy depends on how rapidly nuclear energy is utilized," Dr. Lof concluded.

# 4. Shale Oil Coming of Age

## . . . with greater energy demand creating market. Costs of shale, however, soon will be under those for crude.

A SHALE-OIL industry is on its way in the United States.

Shale oil will come into its own soon because technical improvements will make its costs competitive. Increased energy demand will provide the extra market.

Dr. Charles H. Prien, chemical division director at the University of Denver's Research Institute, also forecast that shale oil eventually will become increasingly cheaper to produce than domestic crude oil.

"The improvements which will still logically occur in shale technology will only serve to hasten the rate at which this occurs," he told conference delegates.

It now costs the oil industry $1.65 to $2.30 per bbl., exclusive of production costs, to find and develop new domestic petroleum reserves.

He added that the location and extent of the 1,500 billion barrels of oil shale deposits in western Colorado, Utah, and Wyoming are known.

"In the light of rising drilling costs, shale oil is already competitive with domestic petroleum, providing that present shale-oil production costs are equal to crude production costs."

Prien estimated the present cost of mining, crushing, retorting and transporting 25-gal. per ton Colorado shale oil to California at $2.25 to $2.50 per bbl.

These figures include 90 cents per bbl. for mining and crushing shale, 50 cents to 70 cents for retorting, 35 cents for upgrading to make the oil pumpable, and 50-cent pipeline tariff. (Oil men believe the 35-cent processing cost is about 65 cents low).

**Tax help . . .** Potential shale oil producers, however, still need greater tax relief, Prien said.

The federal Government now allows a 15% mining depletion writeoff for oil shale, compared to 27½% applicable to petroleum.

"It is only reasonable that shale oil

and petroleum be given equivalent tax treatment.

The scientist termed foreign imports as the only significant competition for shale oil in the immediate future.

"Nuclear energy, while definitely a long-term competitor, is not expected to advance with sufficient technical rapidity to absorb more than 10% of the energy market by 1980."

Foreign oil, on the other hand, could supply the entire deficit between domestic crude production and demand in 1970. He estimated that domestic production will climb from its present level of 7 to 8 million barrels daily to about 10 million barrels in 1970.

However, Prien does not believe that imports will be allowed to supply the entire growing deficit between domestic crude production and demand in the near future and thus freeze out an oil-shale industry. He declared it is doubtful that U. S. defense policy will ever permit so great a dependence upon foreign crude.

**Underground blast . . .** Prien said prospects are dim for any results soon of an unusual experiment involving shale.

Use of nuclear energy in an underground blast to see if oil can be freed inexpensively from shale beds is being studied by the U. S. Geological Survey at Denver and Project Plowshare at Livermore, Calif.

Prien estimated it will be "10 years before anything successful will come of that, if ever."

He said much research is still necessary on "clean explosions of greatly reduced radioactive yield before this nuclear explosive technique can be pursued further for oil shale, either underground or even as a means of removing surface overburden."

**More research . . .** Prien disclosed that the institute is attempting to establish an Oil Shale Foundation, a 3-year cooperative program of intense basic research in the nature of oil shale.

"Do you realize that we do not even know, as yet, what the chemical structure of oil shale organic matter (kerogen) is?" he asked.

"We need to know more about the chemical mechanism of its decomposition, and of the role of the nitrogen and sulfur compounds present."

The foundation is seeking contributions from interested oil and chemical companies on an equal share, nonprofit basis to finance the research program.

This basic research is needed now, Prien said, "in order that oil shale technology may benefit from its findings 3 to 5 years hence."

**OLD DERRICK** (right) contrasts with new hydraulic rig (left) as . . .

# Oil Show Stresses Economy

## . . . in drilling, production. Odessa exhibits reflect trend to LACT, multiple completions, and lighter equipment.

COST-CONSCIOUS oil men had their pick of thousands of pieces of new equipment in 500 exhibits at this year's Permian Basin Oil Show in Odessa.

It was the biggest single event of Oil Progress Week, attracting 145,000 persons, but the emphasis was not "progress at any cost." Equipment and service firms were bent on showing the oil man how he could get the most for his money.

Heavy emphasis was placed on automatic lease production and custody transfer equipment, lighter and more mobile rigs to handle heavy drilling chores, wellhead and downhole equipment for multiple completions, and pumping installations to handle three zones at once.

Lighter pumping engines and new pump jacks designed to minimize load drew the operators' interest. And a more drastic departure from conventional pumping methods—the sonic pump—bowed in for the first time at a major oil-equipment exposition.

**New hydraulic rig . . .** A revolutionary hydraulic rig proved a top attraction for drilling personnel.

This rig, an experimental model with a depth capacity of about 3,000 ft., has successfully drilled more than 20 wells for Hydro Drilling Co., Tyler.

It dispenses with the conventional draw works, drilling line, crown, and traveling block, and cuts the needed labor force down to a two-man crew (OGJ, Sept. 22, p. 92).

Some design changes have been incorporated in recent weeks to cut rig-up time and further improve portability. The model shown at Odessa has had the lower substructure removed. Three leveling screws now are used for positioning. The compressor, formerly on skids, now is mounted on a trailer together with three butane fuel tanks.

This small rig, plus larger models of the same design for deeper drilling, are slated to go into production for sale to the drilling industry soon.

## Canal Lease Contested

THE FEDERAL Government and the Northern Pacific Railroad are engaged in a court fight over mineral rights to land under a canal in Wyoming.

The property originally was deeded to the railroad by the government in 1864. Northern Pacific later returned part of it for the Frannie Canal, part of the Shoshone reclamation project. Continental Oil Co. discovered oil on the property after obtaining a lease from the railroad in 1946.

Now the government claims ownership of the mineral rights. Northern Pacific and Conoco are contesting the claim.

# New Anti-Smog Rule Attacked

## . . . by industry spokesmen. They say passage would mean ruin for California independent producers and refiners.

ALREADY SADDLED with costly anti-smog restrictions, Los Angeles Basin refineries were the target last week for another anti-smog rule which could cost $25 million a year.

The rule would prohibit burning fuel oils containing more than 0.5% sulfur from April to October in the basin. Presumably, this would lower sulfur dioxide levels in the atmosphere. The rule was proposed by the Los Angeles County Air Pollution Control District.

**Opposition . . .** The new regulation immediately came under attack by spokesmen for the industry who testified at a special hearing called by the county board of supervisors.

In substance, their testimony was:

**. . . Low sulfur** fuels as required by the proposed law could not be made from the typical low-gravity California crudes.

**. . . The rule** would have the immediate effect of eliminating a market for 5½ million barrels of fuel oil yearly. This would require shutting in 12½ million barrels yearly of heavy crude with the ultimate loss in revenue of $25 million.

**. . . It could eliminate** the independent producer in California, the bulk of whose production is in the low-gravity crude fields.

**. . . The independent refiner,** who relies heavily on low-gravity crudes with their high residual-fuel yield, would be driven out of business.

All expressed the opinion, based on industry and independent research groups findings, that the rule would have no effect on reducing smog if it was adopted.

**Hardest hit . . .** Probably the independent producer would be hardest hit by the rule.

According to statistics, the independent producer now accounts for 45% of the state's production. Of this, 60% is low gravity. This 60% would lose its market because of the elimination of a large chunk of the residual-fuel demand.

**More to come . . .** Even if the sulfur rule is tossed out, Los Angeles Basin refiners won't be out of the woods.

The Air Pollution Control District has proposed another rule restricting the olefin content of gasolines manufactured for Los Angeles Basin use. The APCD contends there is a relationship between the olefin content of the gasoline used in cars and the severity of smog produced from their exhaust.

W. L. Faith, managing director of the Air Pollution Foundation, a private smog research group, termed the APCD position on olefins "nonsensical."

A hearing before the county board of supervisors on this rule is tentatively slated for late next month.

# Leasing to Resume

## in Louisiana. Poor-bid ban will end at February sale.

FOR THE FIRST TIME since last July, the state mineral board will offer state-owned lands for lease at its regular meeting February 19.

Leasing was suspended last summer after the July 18 sale brought an average of only $57.36 per acre, one of the worst lease sales in the board's history. Sales in September and November were canceled.

At that time William G. Helis, Jr., chairman of the board, said operators were bidding so low for state acreage that "further lease sales would sacrifice potentially valuable mineral lands for a fraction of their real worth (OGJ, Sept. 1, p. 104).

Helis said last week that if bidding is depressed in February, "the board will maintain its policy of rejecting bids on grounds of insufficient consideration, rather than permit the state to suffer."

He pointed out that the state had budgeted an estimated $25,000,000 from mineral lease bonuses in this fiscal year.

Average bonus for state-owned land in Louisiana dropped from $231.18 per acre in 1957 to $156.64 in 1958.

# *the* JOURNAL *said . . . . . .*

## 50 Years ago

**November 6, 1908**

**The agitation of the question of supplying natural gas to the city of St. Louis from the fields of Oklahoma has called renewed attention to this whole matter of the quantity, value, and endurance of the natural-gas supply of the state. According to the report on natural gas in the United States issued by the Geological Survey for the year 1906, the production for Oklahoma wells was 3,520,396,000 cu. ft. Of course, production of Oklahoma has increased enormously but even with this increase it is not at all certain that the full demands of St. Louis could be met.**

**Concerning The Texas Co.'s new tanker Texas, which sailed October 27 with her third cargo of refined oil for Avonmouth, England, the Avonmouth Daily Press recently published the following:**

**"A good deal of interest attaches to the Texas. Apart from the fact that she has just completed her maiden voyage across the Atlantic, she derives notoriety from having steamed the whole distance burning fuel oil."**

## 25 Years ago

**October 26, 1933**

**Following the official announcement that the merger plans of the Standard Oil Co. of New Jersey and the Standard Oil Co. of California had been definitely ended, there was considerable speculation in New York oil and financial circles as to the probable future expansion plans of the New Jersey company. It is assumed by many that the New Jersey company will continue plans to widen its domestic operations with the view of securing a national distribution of its products.**

**With the administration in Washington still confronted with the critical necessity for higher grain prices . . . The proposal again has been brought forward to blend grain alcohol with gasoline as an automobile fuel . . .**

**Support for the alcohol-gasoline fuel finds influential adherents of the idea considering the distillation of alcohol from wheat a more logical aid to better grain prices than the original suggestion that surplus corn be utilized.**

## 10 Years ago

**October 28, 1948**

**B. A. Hardey, Shreveport, and W. Scott Heywood, Jennings, La., have resigned from the Louisiana State Mineral Board as a result of recent legislation giving control of the board to appointees of the administration of Gov. Earl K. Long.**

**The first long suspension bridges ever built for a crude-oil trunk line are now under construction for the Jal-Cushing (Basin) system being constructed under the direction of Texas Pipe Line Co. for four companies including Texas Pipe Line, Sinclair Pipe Line Corp., and Sinclair Refining Co.**

**Reliable reports to Washington stated this week that Arabian American Oil Co. is preparing to relinquish its one-half interest in the Kuwait-Saudi Arabia Neutral Zone where American Independent Oil Co. last summer secured full oil rights to the other one-half interest.**

# Floating Barges Seen as Key

## . . . to deepwater production off California. They're safe, economical, and structurally strong, Rand tells AIME.

CALIFORNIA'S highly successful floating drill-barge fleet will be joined by floating production barges as offshore operations move into deeper waters.

The timetable depends on how fast California operators get into 200-ft.-plus waters, according to W. W. Rand, Submarex Corp., Santa Barbara.

Production testing from barges will probably be in vogue in 5 years, and within 10 years, all drilling and production in deeper waters will be conducted from floating barges, Rand predicted before the fall meeting of the Los Angeles Basin section of the Society of Petroleum Engineers of AIME.

Feasibility of floating production facilities has been proven by experience with drilling barges, Rand said. By using floating production barges, three of the biggest problems facing deepwater oil prospectors can be solved: the need for a structure strong enough to hold drilling and production equipment at an economical price with maximum safety features.

**Depth no problem** . . . The extreme water depths close to California's shore won't be a problem to floating-barge production facilities, Rand said.

But these same waters, where 400-ft. depths are encountered within a mile or two of shore in many places, will be a severe obstacle to drilling platforms.

Drilling barges show that a floating structure, regardless of hull design, can be safely anchored off California to withstand any known storm or wind forces. And in earthquake-prone California, floating equipment would be in less danger than stationary structures, he pointed out.

Rand cited these factors in favor of the floating barge:

. . . **Protection against corrosion** is possible by cathodic means or inert coatings. And a floating barge can be made large enough to be only slightly affected by waves and swells.

. . . **Correct position** can be achieved at the site by anchor winches.

. . . **Conductor pipe** suspended from the barge can be protected against vertical motion by slip-joints similar to those used in drilling-barge operations. Flexibility of the pipe will take care of any slight horizontal movement.

. . . **Gas separation** and field storage facilities can be built into the hull. Field storage tanks can also be installed on separate floating units if necessary.

. . . **Pumps and christmas trees** can be installed on the barge with blowout prevention equipment installed at the ocean floor. In addition, comfortable quarters for the pumper can be built on the barge.

# High Bids Attracted

## by Swan Hills. McMahon, Home get choice acreage.

NEW LEASES awarded in the promising Swan Hills area of Canada will add spice to the winter drilling season just around the corner.

Top bidders paid more than $5,900,000 for drilling rights on 1,600 acres at Swan Hills. This was more than half of the $10,150,418 netted by the Alberta Government in its recent crown-reserve lease sale.

Most of the Swan Hills acreage went to C. L. McMahon, Inc., Tulsa, a company which is making its debut in that area. McMahon paid $3,302,010 for 960 acres.

The other two Swan Hills tracts went to Home Oil Co., Ltd., French Petroleum Co. of Canada, Ltd., Kern County Land Co., Fargo Oils, Ltd., and General American Oil Co. In joint bids, these five companies paid $2,601,000 for 640 acres.

The recent lease sale included parcels in nine other fields. The only wildcat reservation offered was in the Dorothy region in southeastern Alberta, about 80 miles east of Calgary. This 40,000-acre parcel went to Canadian Kewanee, Ltd., for $407,750.

# *PROCESSING BRIEFS . . .*

**Contracts** for a $750,000 asphalt plant at its Tacoma, Wash., refinery will be awarded within 30 days by U. S. Oil & Refining. Completion is planned for February 1959.

**The new natural-gasoline plant** at big Steelman field in southeastern Saskatchewan will be officially opened October 30. Built by Steelman Gas, the plant has initial capacity of 25,000 M.c.f. daily. Design capacity is 45,000 M.c.f. Dry gas will go to Saskatchewan Power Corp.

The plant is part of a $16-million program to conserve gas at Steelman, where 570 wells were producing 31,800 bbl. of oil daily as of January 1. Refinery Engineering built the plant.

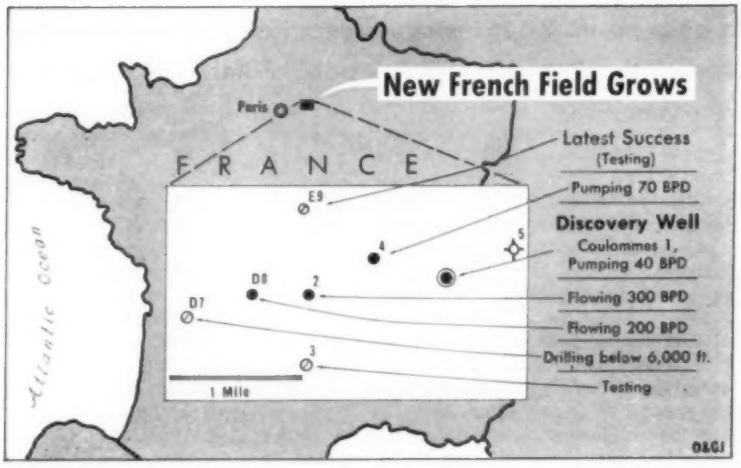
**The recent fire** which damaged compressor facilities at Esso's ethylene plant at Baton Rouge, La., has not interrupted normal supply to customers. Requirements are coming from underground storage and lower-purity ethylene streams. It will be 6 months before the plant returns to normal operations.

**A new laboratory** for research in chemicals has been opened by Escambia Chemical Corp. at Wilton, Conn. Escambia was organized 4 years ago by United Gas Corp. and Electric Bond & Share Co. to produce ammonia, nitrogen products, polyvinyl chloride, and methanol. Plant facilities are at Pensacola, Fla.

**A new plant** for natural-gas processing and cycling will be built by Shell at Weeks Island field in Louisiana. Capacity will be 120,000 M.c.f. daily, of which about 70,000 M.c.f. will be reinjected into the producing formation. The program calls for three additional 13,300-ft. gas wells on the north side of the structure and two 12,500-ft. injection wells.

**Standards on gaseous fuels** have been brought up to date in a book just released by the American Society for Testing Materials. The book replaces a 1954 edition. It contains four methods for sampling and measurement and nine methods of testing and analysis. Of these, seven are new, revised, or have changed status since 1954. Copies may be obtained for $3 at ASTM headquarters, 1916 Race St., Philadelphia.

**Complete all-electric** control instrumentation will be installed in Esso's new 100,000-bbl. refinery at Rotterdam, Holland. A $200,000 contract for Autronic equipment has been let to the Swartwout Co. of Cleveland. General contractor for the entire refinery construction project is Badger Manufacturing Co.'s foreign affiliate. Esso Research & Engineering Co. engineered the job.




# Petrorep Scores Five Hits

**. . . at Paris basin's first pool. Output climbs to 610 bbl. daily as new well nears completion. More drilling set.**

ONLY ONE of the eight wells in France's newest oil field 27 miles east of Paris has been tagged dry by the operator.

With four wells already on production, Ste. de Recherches Petrolieres dans la Region Parisienne (Petrorep) is busy testing two more, drilling ahead at one, and making plans to spud another pair.

The field is the first in the big Paris basin and France's best since Parentis came in about 4 years ago. Petrorep made the discovery last winter about 5 miles southeast of Meaux (OGJ, Mar. 3, p. 85).

The privately owned French firm has been feeling its way to find the best completion methods in the new field. Two big questions have been whether to set pipe on top or through the pay, and the effects of acidizing.

The latest success is the Coulommes E9 on the north side of the structure which tested about 45 bbl. of oil per hour on drill-stem test of the Dogger section of the Middle Jurassic lime, found at about 6,100 ft. Unlike the other wells, pipe was set through the pay, and Petrorep planned to perforate.

The other well still testing is the Coulommes 3. This well initially tested only several barrels of oil per hour. Acidization was tried, but vertical fractures brought in water from lower formations. The operator is attempting to shut off water with squeeze jobs.

The dry hole is the Coulommes 5 on the east side of the field. There Petrorep ran into low porosity and permeability. But the operator still hasn't quite given up on it. Fracturing may be tried in hopes of making it a small producer.

On the west end of the field, the Coulommes D7 was nearly 100 ft. low structurally, and the regular pay formation watered out. But the company is taking the hole deeper.

Off the structure, another Dogger test is under way about 16 miles northeast of the discovery. The CR 1 passed through the lower part of the Middle Jurassic with no shows, and crews were drilling ahead.

**The discovery . . .** The Petrorep discovery caused a lot of excitement among the French last winter when the Coulommes 1 recovered 50 bbl. of 33.5°-gravity crude on a 75-minute drill-stem test of a 66-ft. section at 6,060-6,126 ft.

The discovery is on an anomaly found by a seismic survey and confirmed by core holes. The structure is about 12 miles long and 6 miles wide. Porosity was 15% with good permeability.

The Paris basin covers much of north-central France. The Petrorep license takes in 1,588 sq. miles mostly northeast of Paris.

Petrorep is one of the few companies exploring in France without government participation. The discovery was the company's first wildcat.

Petrorep is 51% owned by Petrofrance, a local marketing and shipping firm. The Rothschilds and other French investment trusts own the remaining 49%. Consulting geologist for the firm is C. G. Carlson, Tulsa.

The crude is being trucked to a bulk terminal near Paris, for barging down the Seine River to LeHavre.

## Firms Leave Egypt

**after exploration program proves to be unsuccessful.**

FOUR BIG American independents are pulling out of Egypt after spending $30 million prospecting in the western desert.

Sahara Petroleum Co. and the United Arab Republic have reached a friendly agreement on ending the 4½-year-old concession covering 90,000 sq. miles of northern Egypt, from the Nile River to the Libyan frontier. Word of the move came from London. The company's U. S. offices last week had not received confirmation.

Sahara Petroleum, a subsidiary of Continental Oil Co., has been the operator. Continental's partners in the venture have been Ohio Oil, Cities Service Co., and Richfield Oil Corp.

Nine wells were drilled in the program. Traces of oil were found in some tests but these were not commercial. The final wildcat, Mamura 1, on the Mediterranean Coast 75 miles east of the Libyan border, was taken below 12,000 ft. Two earlier wells neared 15,000 ft.

## Shell Is Target in Cuba?

CUBAN properties of Royal Dutch-Shell could be the next sabotage target of the island's rebels.

Rebel leader Fidel Castro is sore at the British because they sold the Cuban Government jet planes. He has ordered confiscation of British property in the territory he controls and the detention of British citizens who do not leave within a few days.

Because of partial British ownership of Shell, there is speculation in Havana that Shell service stations and the nearby 27,000-bbl. refinery of Cia. Petrolera Shell de Cuba may be targets of the rebel underground.

Rebels last week kidnapped two American employes at the Santiago refinery of The Texas Co. The rebels notified the plant manager that the men would be returned.

# Oil Industry Has a Big Stake in

• No matter who ends up in the top spot, it's practically certain that efforts will be made to change the country's basic oil policy. And that could mean trouble for private companies.

VENEZUELA'S privately operated oil industry may be headed down a rough road in the months to come.

The country's political machinery is still stalled in its efforts to give the country an elected government. Whether it starts off fast or slow, it probably will dig some deep chug holes for the oil industry to travel over.

Venezuela's political parties have been trying to present a unified front for the presidential elections next month. So far, they all agree on only one thing. Everyone wants a bigger cut from the country's oil.

Venezuela's leftist political element (this includes most of the country's active politicians) is riding the crest of a postrevolution wave and getting more vigorous as it tests its new freedom. The oil industry is already somewhat suspect in the eyes of this group because of an era of booming expansion under Dictator Marcos Perez Jimenez. It's no longer popular to prosper under a dictator in Venezuela.

When Venezuela's exiled political leaders hurried back to Caracas after last January's bloody revolution, they found the government in the hands of a temporary military junta that was anxious to avoid more turbulence and blood spilling. It was decided by all concerned that it would be best for the country to call an informal moratorium on rough-and-tumble politics.

The country's leaders, both political and military, agreed to decide on a single candidate for the presidential balloting.

The huddles, conference, and jockeying for position have gone on since that time. Rival political leaders scrambling for strength and for issues to excite popular interest have settled on the country's prime industry—oil.

Rear Admiral Wolfgang Larrazabal, the navy man who heads the governing junta, let it be known he wouldn't be a candidate unless he was a "unity" choice of all parties.

Then, Accion Democratica, the country's most powerful party, nominated Romulo Betancourt as its prospective president. The Christian Socialists (COPEI) named Dr. Rafael Caldera as their choice. The final blow would have been for the Republic Democratic Union (URD) to nominate Jovito Villalba. That would have been the end of any idea of unity.

Last week, Larrazabal began to re-

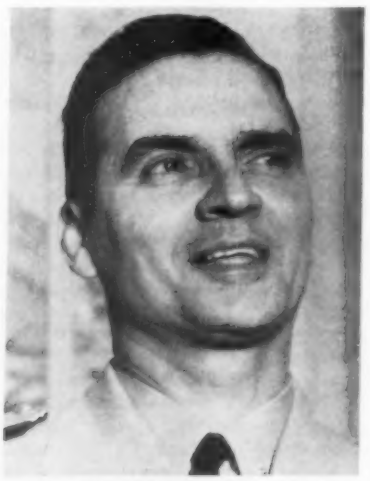
# These Four Men Are Venezuela's

THREE MEN have been nominated for president of Venezuela.

These three—and a fourth—have figured in a plan calling for a president and a four-man council to rule the country. They are:

## Wolfgang Larrazabal

The Navy man, who has headed the governing junta since Gen. Marcos Perez Jimenez was overthrown and forced to flee the country, has been named by the Republic Democratic Union (URD) as its presidential choice.



Rear Adm. Wolfgang Larrazabal

Larrazabal earlier had refused to be a candidate for president unless he could have the support of all the parties. At that time he was soundly criticized in some quarters for his "soft" treatment of the country's small but active communist groups. The admiral's refusal to curb the communists has been interpreted as an effort to solidify all political groups behind his own candidacy.

After the Christian Socialist and Accion Democratica parties selected their own candidates, Adm. Larrazabal accepted the nomination by the URD.

## Dr. Romulo Betancourt

The Accion Democratica party leader, Dr. Betancourt was president of Venezuela from 1945 to 1948. He has very definite ideas on oil, and wrote a book, "Venezuela, Politics, and Oil," during his years of exile.

Betancourt's pet theme is the threat of Venezuela running out of oil at its present rate of production. He says flatly that Venezuela should not be interested in expanding its production. He wants output frozen at a maximum of 3,000,000 bbl. daily.

His five basic points on oil are:

... **More of the profit** from oil for the government.

... **A national oil company** with some private capital but with Venezuela firmly in control.

Dr. Romulo Betancourt

... **A national tanker** company to transport Venezuelan oil.

... **More refining** of Venezuelan oil in the country.

... **No new concessions** on the theory this would be contrary to Venezuela's best interests.

# Venezuela's Presidential Election

gain ground. URD named the admiral its presidential choice and he agreed to run. There was every indication that Betancourt might withdraw, especially if Larrazabal would agree to the AD plan for a president and a council of four to rule the country. Betancourt proposes that he, Caldera, Villalba, and a fourth civilian compose this council.

Only Caldera's party held out. COPEI has insisted all along that the president be a civilian.

**Oil's stake . . .** Whether the three parties finally agree on Larrazabal or not, it's almost certain there will be concerted efforts to change the country's basic oil policy.

All three major political parties have joined in the growing clamor against the country's present oil policy. This is being done in spite of the fact that Venezuela's historical free enterprise oil system operating under the watchful eye of the government ministry has made the country the richest in Latin America.

The communists have used every possible excuse since January—many of them pretty far fetched—to cry "imperialist dogs" at Americans in general and U. S. oil men in particular.

All Venezuelan politicos have been watching a new pattern of profit splitting emerging in the Middle East each time a new concession is granted. After Italian and American companies made the so-called 75-25 deals in Iran and the Japanese offered Saudi Arabia and Kuwait 56% and 57% of the profits for new concessions, more and more Venezuelans have decided that 50-50 isn't enough for them any longer.

They have been particularly nettled by U. S. Government action in restricting imports of foreign crude without first consulting Venezuela. Just a week ago, Dr. Eduardo A. Acosta, minister counselor for petroleum affairs at the Venezuelan embassy in Washington, insisted that Venezuelan oil should be considered domestic by the U. S. (OGJ, Oct. 20, p. 60).

The companies which produce Venezuela's oil have always tried to steer clear of the country's politics. They will probably continue to do so, but politics may mean trouble for them all in the future.

**Leavening influence . . .** Each time the antiprivate oil enterprise statements get too wild, a small quiet-spoken official steps up and asks to be heard.

Dr. Carlos Perez de la Cova, the engineer-diplomat who was called back to Caracas from Washington to take over as Minister of Mines and Hydrocarbons after the revolution, has held repeated press conferences in past months. Each time he calls in the press it is to refute some new politically inspired "fact" about the country's oil industry.

Perez de la Cova has made no secret of the fact he believes Vene-

# Strongest Political Leaders

## Dr. Rafael Caldera

Leader of the Christian Socialist (COPEI) party, Dr. Caldera was nominated as his party's presidential candidate.

Caldera has not enumerated his ideas in much detail, but he has blamed the oil industry, at least by implication, in the past for what he charged was wholesale plunder of the country's resources during the regime of Gen. Marcos Perez Jimenez.

Like others in Venezuela, Caldera leaves the impression that it's the oil industry's fault for making the government wealthy enough to make theft so tempting.

Dr. Rafael Caldera

## Jovito Villalba

Villalba is spokesman for the URD, which named Adm. Larrazabal as its nominee.

Under a plan proposed by the AD party, Larrazabal would be president and Betancourt, Caldera, and Villalba would be three members of a four-man council ruling the country.

Villalba's publicly expressed oil policy follows that of Betancourt on some points, but goes further.

Here's the URD's basic policy on oil:

**. . . A mixed capital company,** government and private, to concentrate on exploitation of natural gas and distribute it to every corner of Venezuela.

**. . . A similar company** to engage in oil production and refining.

**. . . Government representation** on the board of directors of any company operating in Venezuela.

**. . . Regulation of oil** production with all increases to be based on percentage increases in reserves from the year previous.

**. . . At least 50%** of the oil produced in Venezuela to be refined in the country.

Jovito Villalba

**. . . Conservation** in the hands of a national petrochemical company.

**. . . Petroleum exports** should be a cornerstone of Venezuela's commercial and diplomatic policy.

zuela is in good shape because it has let private capital develop its oil.

Last week the minister called another press conference because charges were flying thick and fast that Venezuela has lost its sovereignty over its oil to private industry. He said the contrary is true and pointed out that Venezuelan auditors have traveled to Curacao, The Hague, and to New York to check private company books when taxes were questioned.

The minister likes to contrast Venezuela's oil policy with Brazil's when dealing with critics. He is fond of saying that Brazil's motto "on petroleo e noso" (petroleum is ours) also applies to Venezuela. Then he adds, "But it has no meaning when the oil can't be raised from the ground. It's useful only when converted into productive wealth."

Whether Perez de la Cova's political courage and logic will be heeded in the heat of a postrevolutionary election campaign is something else again.

## Refinery on Stream

### in Neutral Zone completes Aminoil building program.

A 30,000-BBL. daily refinery went into operation in the Kuwait-Saudi Arabia Neutral Zone, completing the expansion program started last year by American Independent Oil Co.

The unit is now producing products for world-wide markets. Aminoil holds the concession covering the Kuwait half interest in the Neutral Zone.

Getty Oil Co., which holds the Saudi Arabia half interest in the zone, recently completed a similar plant.

Aminoil's program also included a new 12-in. pipeline paralleling the existing 8-in. and 10-in. line from the Wafra producing field to the refinery and shipping terminal at Mena Abdulla.

A new pumping station with four 1,000-hp. pump units was constructed at Wafra. Tankage additions at the Wafra field, the refinery, and the shipping terminal totaled 1,180,000 bbl. A 270,000-bbl. reservoir also was constructed to store fuel oil.

New tanker-loading facilities are adequate to handle the world's largest tankers. A new tanker sea berth more than 3 miles offshore is served by a 24-in. submarine line.

Carroll E. Bradberry & Associates, consulting engineers, designed the facilities. Arabian Bechtel Corp. supervised the construction. Collins Construction Co. installed the new submarine loading lines.

## Floating Rig Mover Saves Time, Money

A NEW FLOATING rig mover is being operated on Lake Maracaibo by Creole Petroleum Corp.

It is designed to move drilling rigs —substructure, draw works, and derrick—from one site to the next on the lake. Company officials expect its use will reduce operating costs and cut in half the usual rig-up and rig-down time. The operations of the rig mover, similar to that of a self-propelled fork lift, are controlled by one operator.

The rig mover is similar to a unit used in eastern Venezuela as early as 1951. Creole wanted a rig mover more adaptable for operations on Lake Maracaibo, with its severe wave and wind action.

Cost of the mover is about $1,000,000. One major cost-saving feature of the machine is the elimination of need for a permanent derrick for each well site. Creole says the anticipated savings in operating costs indicate the investment will be justified.

## Argentina's Output Will Jump

### . . . under the proposed, 6-year, $800-million development contract with U. S. firms. Goal is 136,700 bbl. daily.

AN OUTPUT of 136,700 bbl. of oil and 452,000 cu. ft. of gas daily by 1965 is Argentina's aim under the agreement it will sign next month with a group of U. S. companies.

A general agreement for the $800 million, 6-year development program in the Comodoro Rivadavia area was signed in Washington this month (OGJ, Oct. 20, p. 71).

The plan calls for the drilling of about 4,000 wells ranging in depth between 5,000 and 6,000 ft. Argentine oil experts place the initial average production of each well at 20 cu. meters, or about 125 bbl. daily.

The drilling area is in what geological and geophysical tests have shown to be an uninterrupted series of structures extending west to the foothills of the Andes.

Technical information regarding the location and prospects was made available last week through the Argentine Embassy in Washington. It showed that many of these structures already have been drilled, with wells already in full production.

Projections of possible production prepared by Yacimientos Petroliferos Fiscales foresee an output of 5,230,000 bbl. of oil in the first year of operation under the contract.

Output the second year is expected to jump to 16,475,000 bbl. and in subsequent years to increase, progressively, to 30,500,000 bbl., 40,450,000 bbl., 46,900,000 bbl., and, in the sixth year of the contract, 50,900,000 bbl.

The agreement calls also for the building of a 1,300-mile pipeline from the development area to Plaza Huincul and Buenos Aires to move gas produced with the oil. The YPF figures that in the sixth year of operations gas production will be the equivalent of approximately 3 million cubic meters of petroleum.

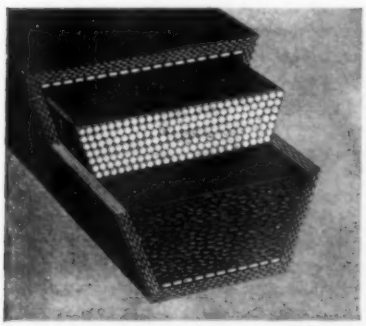
# BOSTON Helps Set World Depth Record

## History-making wildcat has used same BOSTON V-Belts since spudding-in in 1956. Belts look good for another 25,000 ft.

When the Phillips Petroleum Company's famous well, the University EE-1 in Pecos County, Texas, surpassed the former drilling-depth record in May, the crew had mastered a fair share of trouble . . . including a whipstock at a record depth of nearly 20,000 ft. And since then, they have set new records in length of casing . . . depth of pipe . . . total column of cement. And as of early September, they were still making hole.

Throughout this whole record-breaking performance, the same set of BOSTON V-Belts has been on the job driving the mud pumps . . . completely trouble-free, and looking as if they could go another 25,000 ft. They went to 17,500 without a take-up, and were re-set then only because bigger pumps were installed.

This whole remarkable achievement tells a lot about the men and the equipment on the job. And a closer look at the belts

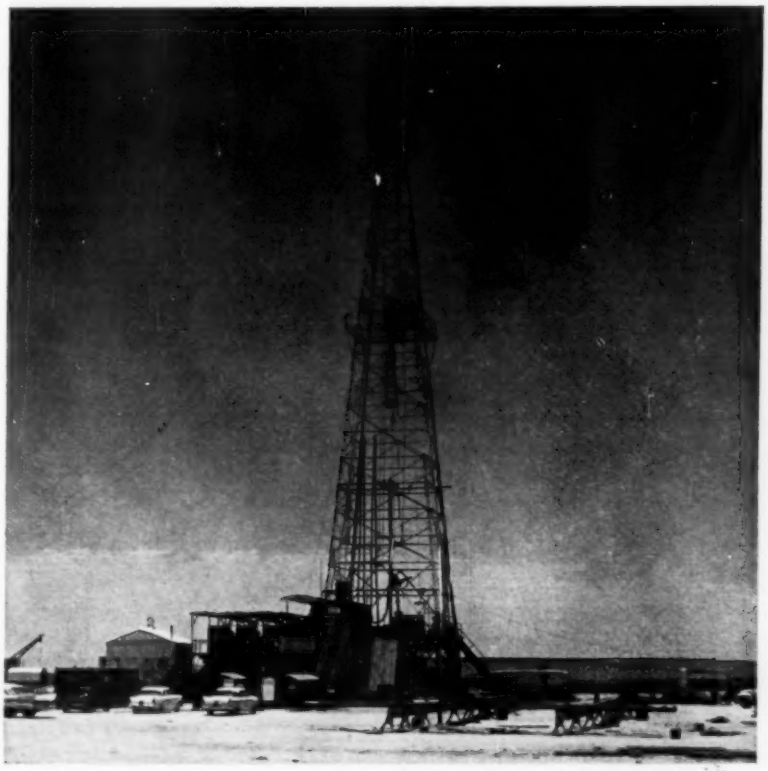


involved will show exactly why they have played their part so well.

They were made by Boston Woven Hose and Rubber Company — a part of their standard line, which features every advanced development in the industry. The tensile members are Dacron* . . . with a moisture regain only 1/20th that of conventional reinforcing fibres, giving tremendous stability through humidity changes . . . 40% stronger than conventional tensile fibers . . . and put through a special heat and tensioning process for even greater stretch resistance.

To provide necessary resistance to oils, heat, abrasion, chemicals and ozone, BOSTON V-Belts are made with Neoprene. And the Fiber-Dispersed stock provides high cross-wise rigidity, exceptional length-wise flexibility, and extra support for the tensile members during shock-load impact and during normal operation.

With new BOSTON Multiple V-Belts you, too, can cut down maintenance, save matching and take-up time, and reduce your V-Belt inventory. Remember, for industrial rubber products . . . including all types of hose and belting . . . BOSTON serves you best. For more information, write:

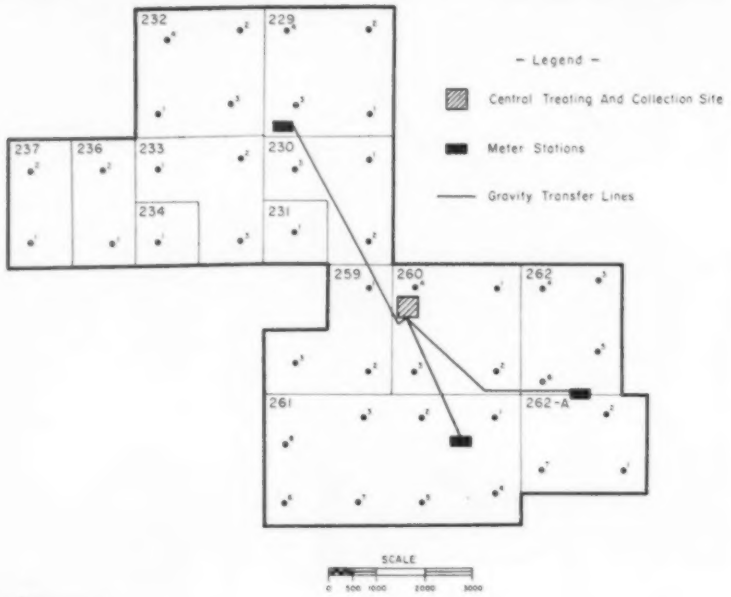


Record Phillips' well approached 25,500 ft. in September

*DuPont polyester fiber

**BOSTON**

**BOSTON WOVEN HOSE & RUBBER CO.**
DIV. OF AMERICAN BILTRITE RUBBER CO., INC.
**BOSTON 3, MASS.**




PRODUCTION

# Water-treating, injection project boosts efficiency

A SYSTEM to collect oil and water at centrally located collection sites has been installed by Sun Oil Co., operator of Segment 3, SACROC unit. This, in conjunction with the automatic custody transfer equipment, means a big saving in the number of lines required and an over-all increase in operating efficiency.

Located in the Kelly-Snyder field, Scurry County, Texas, the installation was completed by Sun personnel under the supervision of the SACROC unit manager.

BY W. F. WALKER
Sun Oil Co.

Author is engineer, SACROC Unit Segment No. 3 operated by Sun Oil Co.

At the central collection sites the oil is treated and delivered to the pipeline and the water is placed in the produced-water gathering system. From there, the water is transferred to the produced-water treating and reinjection plant.

The SACROC unit pressure maintenance program presently involves the injection of water into 66 of the unit's 1,249 wells.

**Producing facilities . . .** Consolidation Project 260 encompasses an area of approximately 2½ sections on which 40 wells are located. Twelve tank batteries in the project area have been eliminated and replaced by four meter stations, three of which are remotely located from the central treating and collection site. Automatic well test and recording facilities installed at each of the meter stations permit the pumper, who supervises production, to obtain a three-hour production test of every well in the project area each day.

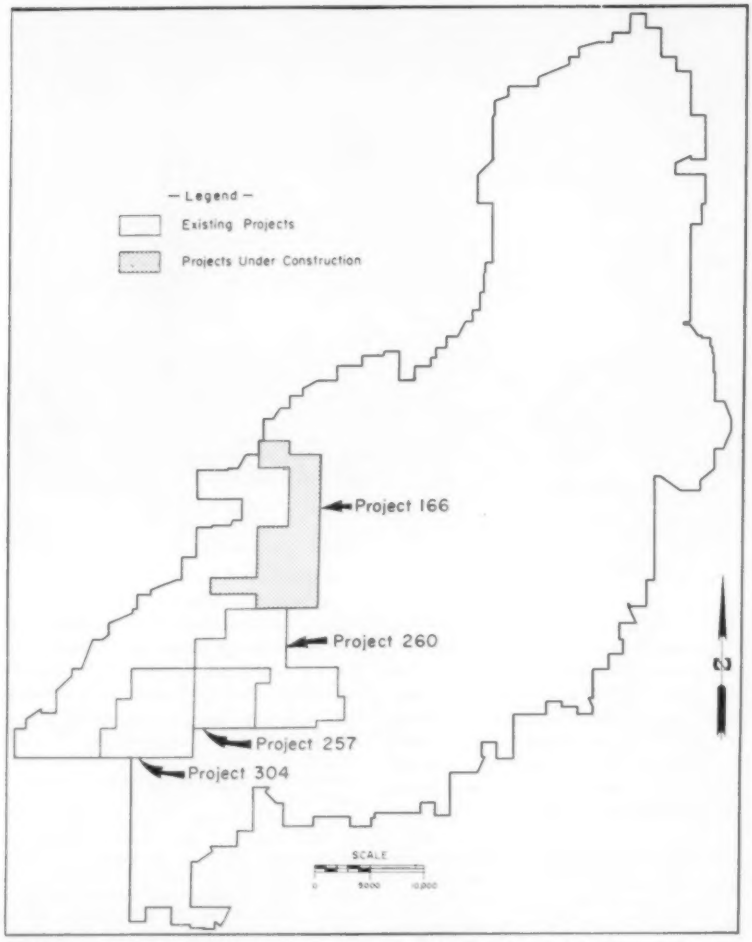
Since produced gas is delivered to the gas-gathering system at the individual meter stations, which are located on sites formerly occupied by tank batteries, enlargement and revision of the gas-gathering system has not been necessary. In addition, the delivery of produced gas at the stations has permitted the use of smaller lines to transfer the produced oil and water from the stations to the central treating and collection site.

Gravity lines are used for the transfer of produced oil and water to the central treating and collection site located on Tract 260. There the produced fluid is routed by header to the heater treaters serving the site. Produced water from the treaters is dumped directly into the produced-water gathering system. Clean oil from the treaters is dumped into a 750-bbl. surge tank located immediately upstream of the automatic custody transfer unit. After being automatically measured, the oil is pumped into 1,000-bbl. stock tanks for a comparison of automatic and conventional stock-tank measurements.

**Custody-transfer system . . .** The automatic gaging system is a 50-bbl. package unit supplied to meet SACROC unit specifications. The unit along with its remote control and recording facilities was installed by Sun Oil Co. crews and a local electrical contractor.

On May 19, 1958, with a representative of the Texas Railroad Commission present, the system was placed on official test run to compare automatic and conventional stock-tank measurements. Pipeline seals were placed on all vital control and recording equipment by Service Pipe Line Co. Since that time the system has measured over 83,000 bbl. of oil with an average difference in repeatability of 0.05%.

The automatic gaging system's electrical controls and recording facilities are installed in a control house




**CONSOLIDATION PROJECTS** in Segment 3, Kelly-Snyder field, Scurry County, Texas.

at the central collection site along with the automatic well-test facilities for the meter station. Recording equipment is housed in a sealable wall-mounted cabinet and is designed to permit 1 month's unattended gaging operations. Principal components of the automatic gaging system are:

1. Automatic temperature-compensated volume recorder and ticket printer with remote transmission from measuring tank to control house.

2. Pneumatic temperature transducer coupled with an electrically driven temperature recorder.

3. Electrically driven strip-chart pressure-head recorder with electrically wound spring-motor drive to record during power interruption.

4. Capacitance type b.s. and w. monitor with relays to shut in gaging system and start recirculation pump when preset b.s and w. limit is exceeded.

5. Electrically driven recirculation pump to recirculate oil from surge tank to heater treaters. Time-cycle repeater to permit periodic recirculation on a predetermined schedule.

6. Electrical set-stop counter to automatically shut in system when monthly allowable has been run.

7. Electrically actuated float controls in surge tank for high-level lease shut-in and low-level gaging-system shut-in.

8. Proportional flow pipeline sampler with vaporproof sample container.

**Production control features . . .** Production from the individual wells is automatically controlled by motor valves installed on the wellheads. The valves respond to changes in flowline pressure to permit the automatic opening and closing of the wells. Microswitches are used in conjunction with the motor valves on pumping wells to start and stop the electric motors.

At the meter stations a motor valve is installed between the header for the incoming wells and the production separator. The valve is used to control total production into the station. A throttling-type pneumatic-float control in the production separator will close the motor valve when production in the separator reaches a high level and reopen it when the separator level returns to normal.

Transfer lines from the four meter stations in the consolidated project are connected to a three-way header at the central treating and collection site. Electropneumatic motor valves placed between each heater treater and the header are used to automatically control incoming production. The valves are closed by the following control functions:

1. High-level float-operated shut-in switch in surge tank.

2. High-level limit switch in ground-level gage-head assembly on surge tank.

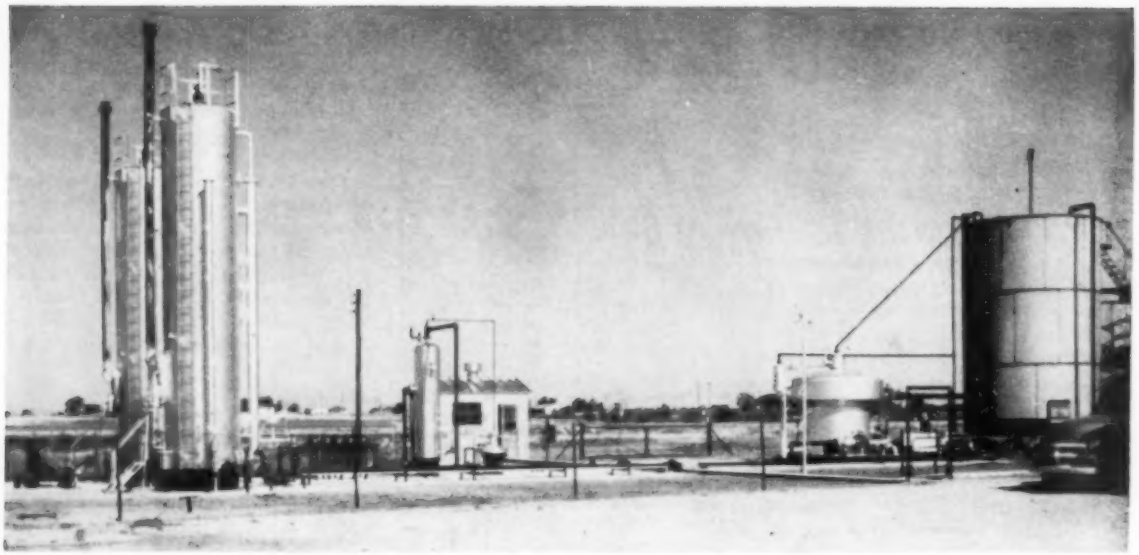
3. Master switch in control house.

To prevent cycling, the motor valves do not open up after high-level shut-in until the automatic gager has lowered the oil level in the surge tank to a point below a float-operated switch located midway up the tank. An additional shut-in feature of the system is the use of capacitance probes in the heater treaters.

The probes are set to shut in the entire project and shut off the gas used to fire the heater treaters when the oil level in either of the treaters approaches the fire box. The probes are installed 3 ft. above the fire boxes in the water phase of the treaters. Included in the capacitance-probe control circuit is a time-delay relay, to prevent shut-in due to momentary voltage fluctuation, and a manual reset switch, to prevent automatic return to operation after a shut-in caused by treater malfunction.

Individual wells in the project area can be manually opened or closed from their respective meter stations. Individual meter stations with their connected wells can be manually opened or closed from the central treating and collection site. In addition, all of the meter stations with their connected wells can be opened or closed from the control house at the central site. The system sharply reduces the cost of project control and supervision.

**Meter stations . . .** Three-way, two-position diverter valves are used at the meter to route individual wells to test. The valves are pneumatically operated and are electrically controlled by an automatic well-test programer. One-barrel dump-type metering vessels are installed in conjunction with automatic samplers to measure oil and water. Gas is measured by an electronic flow computer using differential pressure and static-pressure volt-



**CENTRAL TREATING AND COLLECTION SITE** for Sun Oil Co.'s Project 260.

age transducers. Well identification, barrels of fluid tested, and M.c.f. of gas is recorded on strip-chart recorders located in control houses at each station.

**Method of installation and operation** . . . Equipment salvaged from tank batteries made surplus by the consolidation has been used wherever possible in the reworking and installation of the project. All lines and manifolds are solid-color coded to permit quick recognition of electrical conduit, pneumatic-control gas, produced gas, produced fluid, clean oil, and produced water lines.

The use of company crews to install the project has proved to be a valuable method for training personnel for the future operation and maintenance of automatic equipment. In addition, the use of regular personnel with many years of production experience has resulted in a more practical and workable installation than might have otherwise been realized. Nontechnically trained personnel currently perform a sizable portion of the routine maintenance required.

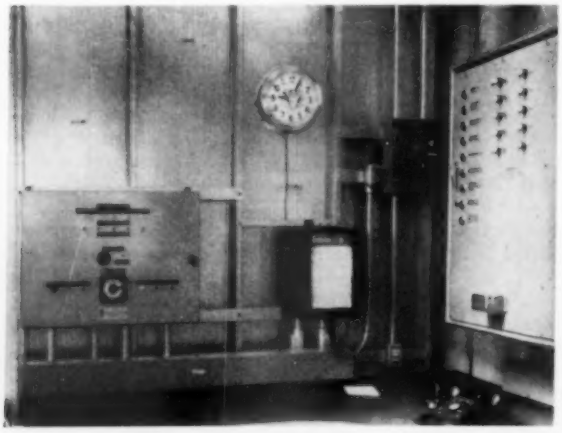
Consolidation Project 260 is supervised by one pumper working 8 hours each day and operates unattended during the remainder of the time.

Operation of the system to date has been satisfactory. The sale of surplus tank-battery equipment and the sharp increase in operating efficiency, which has resulted from the installation, have assured an early payout.

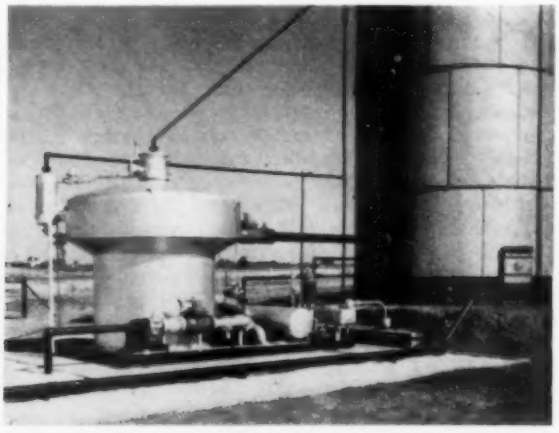
All interested persons are now satisfied with the operation during this trial period conducted under surveillance of a Railroad Commission engineer. After a Railroad Commission hearing and approval, the installation will be ready to be placed in operation without using the conventional tank battery which has been used throughout this trial period.


### Acknowledgment

The assistance and cooperation of Service Pipe Line Co. has made possible an accurate and thorough checkout of the automatic gaging system. The cooperation among other pipeline and purchasing companies, which serve the Kelly-Snyder field, and the SACROC unit manager has permitted the many complex changes in pipeline connections necessary to accomplish consolidation. Sun Oil operator-company personnel instrumental in the design and installation of the project include J. C. Spalding, Jr., M. M. Dyer, Ross Carroll, Jr., and J. M. Eubanks. In addition, the assistance and cooperation of all field operating personnel has contributed to the success of the installation.

**AUTOMATIC WELL-TEST PROGRAMER** and strip chart recorder are housed centrally with the automatic gaging system's controls.



**SEVEN HUNDRED AND FIFTY-BARREL** surge tank and packaged automatic custody transfer unit replaces 12 former tank batteries.

EXPLORATION

# Healthy manhood is predicted for West Canada's infant natural-gas industry

BY JACK G. STABBACK

ALTHOUGH small sedimentary basins do exist in the western part of British Columbia, this discussion is restricted to that part of western Canada containing the western Canada sedimentary basin.

This is a northern extension of the great interior basin of the United States. It extends from the 49th parallel to the Artic Ocean, and includes the southwestern tip of Manitoba, the southern half of Saskatchewan, all but the northeastern corner of Alberta and portions of British Columbia, Yukon and the Northwest Territories. The area of the basin is slightly in excess of 700,000 sq. miles.

Author is gas engineer, Oil and Gas Conservation Board, Province of Alberta. This paper was presented before the Rocky Mountain regional meeting of the Natural Gasoline Association of America, Casper, Wyo., Sept. 18, 1958.

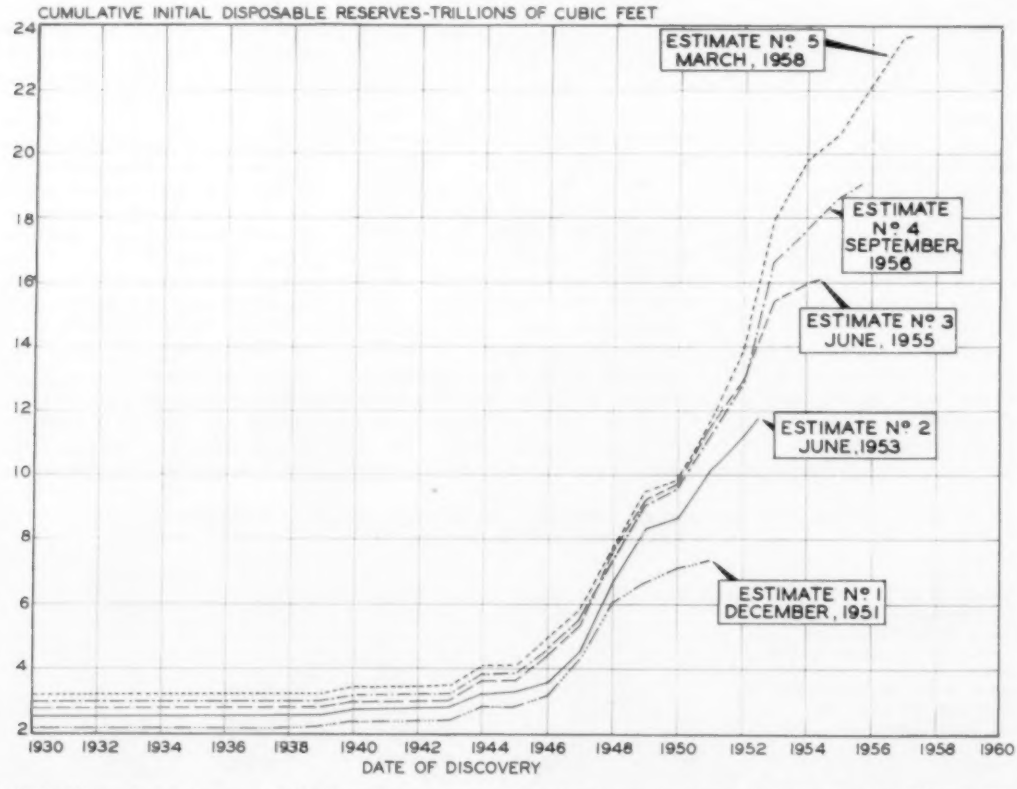
### Present Natural-Gas Reserves

Several of the submissions made to the Royal Commission on Energy, which held hearings across Canada earlier this year, contained estimates of natural-gas reserves of the western Canada sedimentary basin or a portion thereof.

Since the various estimators used different methods of classifying the reserves as to proven and probable and as to producible or pipeline gas bases, the reserves are shown in Table 1 as equivalent reserves of established disposable gas. These will be defined as 100% of the proven reserves plus 50% of the probable reserves, all in terms of pipeline gas. Where surface losses (i.e. fuel gas and shrinkage) are unknown, the average surface discount for the Alberta reserves as estimated by the Oil and Gas Conservation Board has been applied. The average of the reserve estimates after making the adjustments necessary to bring them to a common base, is 23.6 trillion cubic feet for the entire basin as of December 31, 1957.

### Geological Method of Predicting Ultimate Reserves

As previously mentioned, the area of the western Canada sedimentary




**RELATIONSHIP** of cumulative initial disposable reserves of natural gas, by date of discovery, for Alberta. Fig. 1.

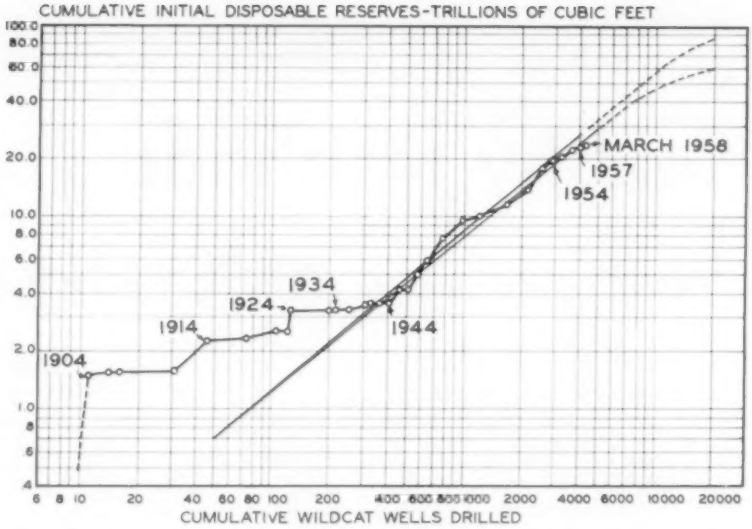
basin is some 700,000 sq. miles. It increases in sedimentary thickness from the Pre-cambrian outcrop on the northeast to about 15,000 ft. along the western edge of the plains and to even greater thickness in the foothills where thrust faulting causes repetition of formation. The total volume of sediments contained in the basin has been estimated in two submissions to the Royal Commission on Energy as 957,000[1] cu. miles and 1,000,000[2] cu. miles. A third study[3] contains an estimate of 789,000 cu. miles of basin sediments which exceed 1,000 ft. in thickness and which are considered favorable for the prospecting for hydrocarbons.

The results of the two previous studies have been adjusted to eliminate the approximately 10,000 cu. miles of sediments lying between the 1,000-ft. and zero contours. Averaging the results of the three studies, one obtains an estimate of favorable sediments of 910,000 cu. miles. The corresponding figure for the Province of Alberta alone, would be 325,000 cu. miles.

A rough indication of the total recoverable oil reserves that may have accumulated within the sparsely explored western Canada basin can be obtained by calculating the volume of the effective sediments within the basin and assigning to this volume an "accumulation factor" expressed in terms of barrels of recoverable oil per cubic mile of sediments. The accumulation factor should be derived from an intensively explored and developed basin or group of basins that closely resemble, in geological nature, the basin under investigation.

This method of estimating ultimate oil and gas resources can be unreliable, owing to the extreme variation in the degree of concentration of gas or oil reserves that exist beneath different basins or beneath different portions of a specific basin.

This is evident in the United States where the accumulation factor derived for different basins in the advanced stages of exploration and development were found to range between 6,000 and 200,000 bbl. of oil per cubic mile of sediments[4]. The inaccuracies of the method can be reduced only by exhaustive geological studies of the basins being investigated[5]. However, owing to the lack of a more reliable method this one is considered in this instance to estimate the total reserves of oil accumulated within the western Canada sedimentary basin.




**TRENDS** in the growth of initial disposable reserves of natural gas for Alberta. Fig. 2.

**Accumulation factor for oil . . .** Two methods for deriving a reasonable accumulation factor were adopted in the presentations by Industry to the Royal Commission on Energy. In one method[2], the total recoverable oil reserves that had been discovered in the United States before January 1, 1958, were divided by the total volume of the effective basin sediments within that country. This resulted in a presently established accumulation factor of 47,000 bbl. of recoverable oil per cubic mile of sediments.

The other method[3] was similar, but confined its investigation to the Mid-Continent region of the United States, a region contiguous with the western Canada sedimentary basin and having a similar geological history. For this region of the United States, an accumulation factor of 63,575 bbl. of recoverable liquid hydrocarbons per cubic mile of sediments was estimated on the basis of total discoveries prior to January 1, 1958.

**And for gas . . .** An average accumulation factor for the occurance of natural gas in the United States' basins is difficult to derive accurately, owing to the uncertainty of the quantities of gas that were produced and flared during the first part of the century. However, our estimate can be undertaken by calculating the ratio of the total established reserves of recoverable gas to the recoverable oil reserves that have been discovered up to the present in western Canada, and applying this ratio to the ultimate total oil reserves calculated by the "accumulation factor-basin volume" method.

Up to the end of 1957, the industry found in western Canada more than 6,000 cu. ft. of gas for every barrel of recoverable oil[2]. This ratio is almost identical to that calculated for Alberta by the Oil and Gas Conservation Board, and corresponds closely to the ratio of presently remaining gas reserves to oil reserves in the

**TABLE 1—ESTABLISHED NATURAL-GAS RESERVES OF WESTERN CANADA, DECEMBER 31, 1957**
(Billion cubic feet at 14.4 and 60° F.)

| Estimator— | Manitoba | Saskatchewan | Alberta | British Columbia | Northwest Territories | Total |
|---|---|---|---|---|---|---|
| Canadian Petroleum Association | 2.7 | 880.0 | 18,841.5 | 1,814.1 | 38.1 | 21,576.4 |
| Government of Saskatchewan | | 1,996.0 | | | | |
| Oil and Gas Conservation Board (Alberta) | | | 21,048.4 | | | |
| Government of British Columbia | | | | *1,590.0 | | |
| British-American Oil Co., Ltd. | | | | | | 23,099.4 |
| Westcoast Transmission Co., Ltd. | | | 22,300.0 | 2,200.0 | | |
| Average | 2.7 | 1,438.0 | 20,730.0 | 1,868.0 | 38.1 | 23,588.1 |

*June 30, 1957, proven reserves extrapolated to December 31, 1957.

**TABLE 2—ESTIMATED REQUIREMENTS FOR NATURAL GAS FROM WESTERN CANADA RESERVES (1958-1987)**

| Market and estimator— | Trillion cu. ft. 14.4 and 60°F. (assumed) |
|---|---|
| British Columbia: | |
| British Columbia Government* | 4.2 |
| Alberta: | |
| Oil and Gas Conservation Board† | 8.0 |
| Saskatchewan: | |
| Saskatchewan Power Corp.‡ | 2.0 |
| Manitoba, Ontario and Quebec: | |
| Trans-Canada Pipe Lines, Ltd.¶ (18.7), ERC and SRI§ (10.8) | 14.8 |
| Total actual Canadian requirements | 29.0 |
| Additional reserves and deliverability | 7.2 |
| Total Canadian requirements | 36.2 |
| **Presently Authorized Export Permits** | |
| Montana: | |
| Canadian Montana Pipe Lines, Ltd. | 0.3 |
| Pacific Northwest: | |
| Westcoast Transmission Co., Ltd. | 1.9 |
| Total | 38.4 |

*Interpreted from "British Columbia Government Submission to Royal Commission on Energy," April 1958. †"Oil and Gas Conservation Board Report to Lieutenant Governor in Council," September 1958. ‡"Petroleum and Natural Gas in Saskatchewan, a Submission to the Royal Commission on Energy," by the Government of Saskatchewan, April 1958. ¶"Submission to Royal Commission on Energy," Trans-Canada Pipe Lines, Ltd., February 1958. §"Markets for Natural Gas in Eastern Canada," Economic Research Corp., Ltd., and Stanford Research Institute, July 1958.

United States.[6] In using this ratio, it should be borne in mind that the ratio can change with time,[2] and that it is subject to wide variations within portions of the basin.

**The ultimate reserves . . .** With these basic factors, it is now possible to estimate the ultimate reserves of oil and gas which may be established within the western Canada basin. By using the presently defined United States' accumulation factor, an ultimate reserve (before production) of 42 billion barrels of recoverable oil is estimated for the western Canada sedimentary basin, some 15 billion barrels of this total being allocated to Alberta. By applying the expected gas-oil discovery ratio to these totals, an ultimate established recoverable reserve of natural gas (before production) of over 250 trillion cubic feet is estimated for the western Canada sedimentary basin, about 90 trillion cubic feet being allocated to Alberta.

The estimate might be considered conservative since they are based on the incidence of presently known reserves for the United States as a whole, instead of the more closely allied Mid-Continent region which has a higher accumulation factor. Moreover, L. G. Weeks has estimated that the ultimate potential resources of liquid hydrocarbons in the United States are over two and one-half times the reserves that have been discovered to the present.[5] On the other hand, certain types of fields which are economic to find and develop in the United States would not be economic if located in the northern part of the western Canada basin. The estimates used, therefore are considered realistic at the present time.

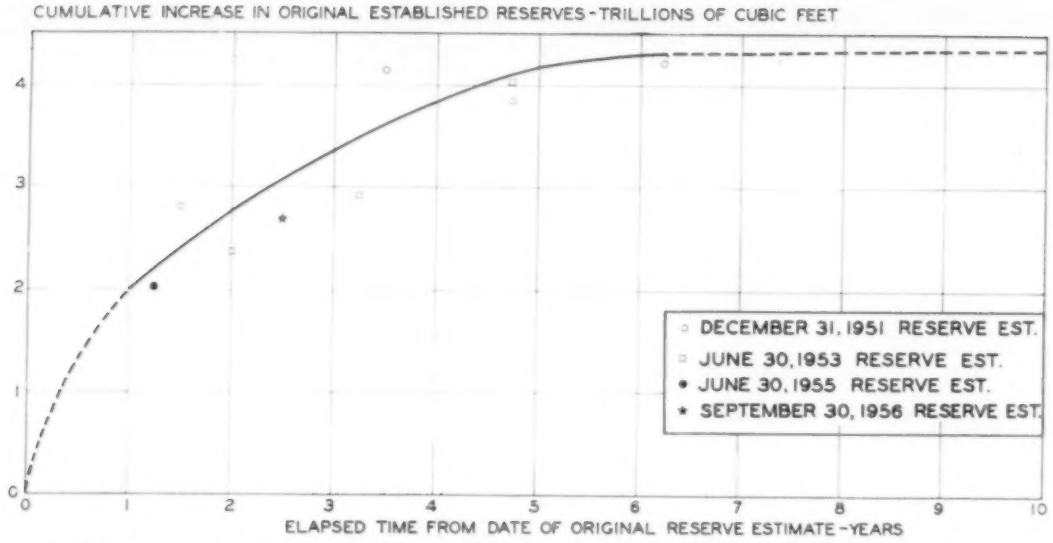
### Statistical Method of Predicting Ultimate Reserves

The Oil and Gas Conservation Board, Province of Alberta, has made continuing statistical studies since 1952, with respect to the trends in exploration and growth of reserves of natural gas in the province. These studies have been included in several published board reports.[7 8 9 10 11] While similar studies have not been made for the balance of the western Canada basin, a comparison can be made, using this method, to the estimation of ultimate reserves obtained

**TABLE 3—GAS-PROCESSING PLANTS, WESTERN CANADA, NOVEMBER 1958**

| Plant location and owner— | Nominal capacity, M.M.c.f.d. residue gas | Plant products: Propane | Isobutane | n-Butane | Total butanes | Nat. gaso. | Stabilized cond. | Weathered cond. | Sulfur | Other |
|---|---|---|---|---|---|---|---|---|---|---|
| British Columbia: | | | | | | | | | | |
| Taylor—Pacific Petroleums, Ltd. | 300 | x | | | x | | | | x | (*) |
| Alberta: | | | | | | | | | | |
| Acheson—Progas, Ltd. | 6 | x | | | x | x | | | | |
| Alexander—Mid-Western Industrial Processors, Ltd. | 50 | | | | | x | | | | |
| Bonnie Glen—Texaco Exploration Co. | 30 | x | | | x | x | | | | |
| Cessford—Hudson's Bay Oil & Gas Co., Ltd. | 125 | | | | | | | x | | |
| Cessford—Canex Gas, Ltd. | 22 | | | | | | | x | | |
| Devon—Imperial Oil, Ltd. | 24 | x | | | x | x | | | | |
| Jumping Pound—Shell Oil Co. of Canada, Ltd. | 80 | | | | | | x | | x | |
| Pembina—Goliad, Ltd. | 80 | x | x | x | | x | | | | |
| Pembina—Texaco Exploration Co. | 8 | | | | | x | | | | (†) |
| Pincher Creek—British-American Oil Co., Ltd. | 85 | x | | | x | x | x | | x | |
| Princess—California Standard Co. | 12 | | | | | | | x | | |
| Provost—Provo Gas Producers, Ltd. | 44 | | | | | x | | | | |
| Redwater—Imperial Oil, Ltd. | 11 | x | | | x | x | | | x | |
| St. Albert—Ajax Petroleums, Ltd. | 20 | | | | | x | | | | |
| Samson—Western Leaseholds, Ltd. | 3 | | | | | | | x | | |
| Stettler-Fenn-Nevis—British-American Oil Co., Ltd. | 18 | x | | | x | x | | | | |
| Turner Valley—Anglo American Exploration, Ltd. | 10 | | x | | | x | | | | |
| Turner Valley—British-American Oil Co., Ltd. | 20 | | | | | x | | | | |
| Turner Valley—Royalite Oil Co., Ltd. | 85 | x | | | | x | | | x | |
| Saskatchewan: | | | | | | | | | | |
| Coleville—Saskatchewan Power Corp. | 60 | | | | | x | | | | |
| Smiley—Imperial Oil, Ltd. | 3 | | | | | | | x | | |
| Steelman—Steelman Gas, Ltd. | 25 | x | x | x | | x | | | x | |

*Gasoline blending stock, naphtha, kerosine, and diesel fuel. †$C_3$-$C_4$ mix.


CUMULATIVE INCREASE IN ORIGINAL ESTABLISHED RESERVES - TRILLIONS OF CUBIC FEET
DECEMBER 31, 1951 RESERVE EST.
JUNE 30, 1953 RESERVE EST.
JUNE 30, 1955 RESERVE EST.
SEPTEMBER 30, 1956 RESERVE EST.
ELAPSED TIME FROM DATE OF ORIGINAL RESERVE ESTIMATE - YEARS

**APPRECIATION** in original established initial disposable reserves for Alberta after original reserve estimate. Fig. 3.

from the geological method for the Province of Alberta.

The following is a brief description of the statistical method of analyzing the trends in the growth of exploration and growth of reserves as employed by the board:

1. All wells drilled in the province are classified under the supervision of the board's chief geologist generally in accordance with the system advocated by Dr. F. M. Lahee.[12] A record of the number of wildcat wells drilled each year is maintained.

2. The board's estimate of established gas reserves in the province is revised every year or so.

3. The relationship of the cumulative initial disposable reserves to the year of discovery of the reserve is established as shown in Fig. 1.

4. The trend in the growth of the cumulative initial disposable reserves in relation to the number of wildcat wells drilled is determined from the history of drilling to date and extrapolated to the cumulative number of wildcat wells expected to be drilled by the time the province has been effectively saturated (assumed to be approximately 1 wildcat per 10 sq. miles or a total of 20,000 wildcat wells). Line ABC in Fig. 2 indicates such a trend. From an analysis of the curves shown in Fig. 1, it has been possible to determine the amount by which the reserves of fields discovered up to and including the date of certain reserve estimations have increased in size when reevaluated in the future. In other words, the degree of underestimation of reserves due to lack of development of recently discovered fields can be ascertained. For example, referring to Fig. 1, the estimate of reserves of fields discovered up to and including 1950, increased from the 7.2 trillion cubic feet shown in Estimate 1 to 8.7 trillion cubic feet shown in Estimate 2 and to 9.9 trillion cubic feet indicated in the most recent estimate, No. 5.

5. Plotting the data obtained through complete analyses of all curves in Fig. 1, as the cumulative increase in original reserve estimate versus the time elapsed from the date of the original estimate, gives the relationship shown in Fig. 3. This graph indicates that an estimate of cumulative reserves made today for all fields discovered to date, when reevaluated 1 year hence, will have increased by 2 trillion cubic feet and when estimated 4½ years from now, will have increased by 4 trillion cubic feet. Ultimately, the present reserves of these fields will have increased by 4½ trillion cubic feet.

6. Use is made of the curve of Fig. 3 to adjust the actual data plotted in Fig. 2 for the degree of underestimation of reserves discovered in the more recent years. A revised extrapolation of the trend in growth of initial disposable reserves with wildcat wells drilled is now possible and is shown as line DEF in Fig. 2.

7. The rate of increase in reserves with time may be obtained from Fig. 2, by estimating the number of wildcat wells which will be drilled each year. In Alberta, the average for the past several years has been approximately 400 per year. Continuing at this rate, the reserves should increase at the rate of some 2 trillion cubic feet per year for the next several years.

Curve DEF of Fig. 2 indicates an ultimate cumulative initial reserve for the Province of Alberta of 85 trillion cubic feet. This is to be compared with the 90 trillion cubic feet previously suggested, using the geological approach.

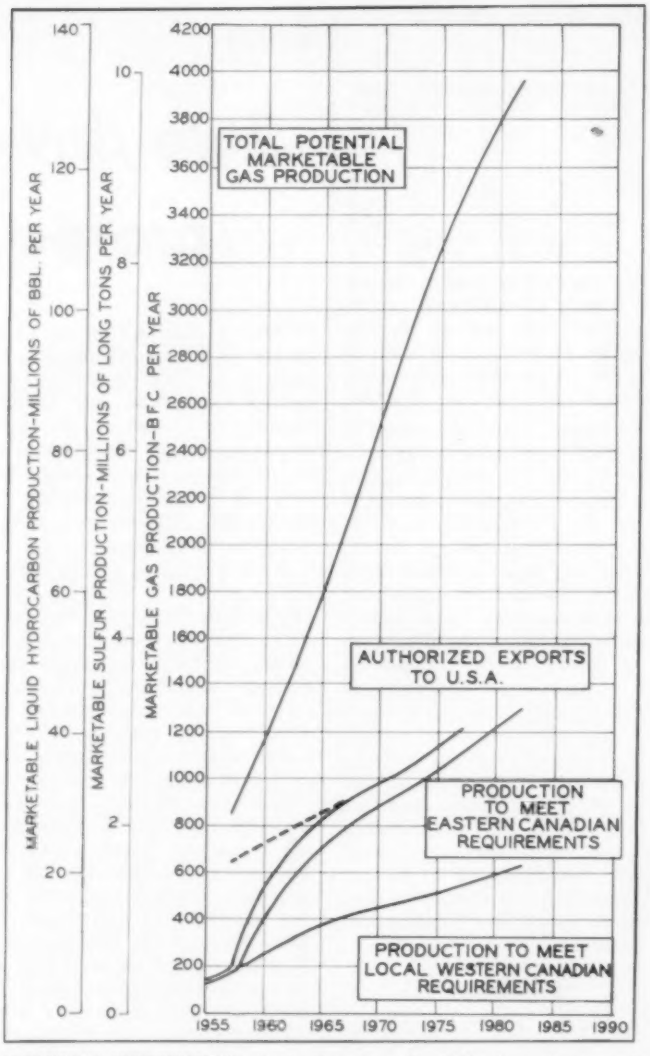
### Market for Western Canadian Gas

The markets for western Canadian gas may be classified as (1) local (British Columbia, Alberta, and Saskatchewan), (2) eastern Canada (Manitoba, Ontario, and Quebec), and (3) United States.

At the various hearings of the Royal Commission on Energy, opinions were expressed indicating that the marketing areas should have priority of supply with western Canadian gas in the order mentioned. Table 2 shows the estimated actual 30-year requirements of each of the three western provinces, eastern Canada and presently authorized exports to the United States. The first column indicates the market area, the second column the estimator of the requirements, and the third column the volumes of gas required in each of the areas.

The additional reserves required for deliverability is the amount of gas required in the ground to provide for deliverability of terminal year peak-day requirements. The factor (25% of the 30-year annual requirements) used to derive this figure was determined through examination of detailed deliverability schedules compiled in the course of many studies of Alberta's reserves and requirements carried out by the Oil and Gas Conservation Board.

Additional reserves for deliverability were not provided for the authorized exports as the periods of export expire prior to the end of the 30-year




**POTENTIAL PRODUCTION** of pipeline gas, liquid hydrocarbons and sulfur for western Canada. Fig. 4.

period under study and the necessary reserves for deliverability would be available from a portion of the reserves otherwise allocated.

**New reserves will come . . .** It may be seen that the long-term requirements of western and eastern Canada plus those of presently authorized export permits exceed the presently estimated reserves. When compared to the reserves which will have been established by the end of the 30-year period, however, a large surplus can be foreseen. Assuming reserves will be established at the rates predicted, a total of 110 trillion cubic feet will be available compared to a 30-year requirement of some 38 trillion cubic feet.

As previously stated, through the use of statistics for the Province of Alberta maintained by the Oil and Gas Conservation Board, it has been possible to reasonably predict the rate of development of gas reserves for Alberta. Similar data for the other portions of the sedimentary basin are not readily available. However, in order to obtain a rough estimate of the volumes of gas which could be produced in the next 25-year period certain assumptions can be made as follows:

1. The rate of wildcat drilling in the Province of Alberta will be maintained at approximately 400 wildcat wells per year for the next 15 years, declining slightly thereafter.

2. The rate of establishment of reserves in Alberta with wildcat drilling will be as shown by Curve DEF in Fig. 2.

3. The rate of establishment of reserves for the balance of the sedimentary basin will increase from 25% of the Alberta rate (approximately correct for the year 1957) to 125% of the Alberta rate at the end of 25 years.

This may be conservative considering that Alberta has 85% of the total established basin reserves at present but contains only 35% of the favorable basin sediments. However, development in a large part of the northern portion of the basin will undoubtedly be slow due to the high cost of exploration associated with the adverse geographical and climatical conditions and the distance from markets.

4. The average rate of production of the established reserves will be consistent with a 25-year uniform rate life. This will give an annual production of 40 billion cubic feet per trillion cubic feet of reserves established.

5. Markets will be available for the gas.

Using these assumptions, one can derive the volumes of potential marketable gas production in western Canada, as shown in Fig. 4. The uppermost curve in the figure indicates the total potential marketable gas production for the years 1958 to 1982 inclusive. The potential production increases from some 850 billion cubic feet per year at present to almost 4 trillion cubic feet per year in 1982.

The three lower curves represent the volumes of pipeline gas which are estimated will be necessary to meet the requirements of western Canada, eastern Canada, and presently authorized exports to the United States.

The area between the third and fourth curve represents potential marketable gas production which appears to be unallocated and available for other markets. This is not entirely the case, however, as contracts have been made and are being made with the owners of a large portion of the presently established reserves for the delivery of gas from these reserves to meet the rapidly increasing market requirements represented by the two lower curves. To take this fact into account the normal market growth trend has been extrapolated back to 1958 as shown by the dotted portion of the third line.

One may conclude that surplus gas in the order of 125 to 175 billion cubic feet per year is now available for new markets. The availability will increase to some 400 billion cubic feet per year by 1960 and well in excess of 1 trillion cubic feet per year by 1970.

### Processing Plants

Until recently most of the gasoline-plant construction in western Canada has been a result of gas-conservation schemes with the plant residue gas

TABLE 4—ESTIMATED BYPRODUCTS RESERVES, WESTERN CANADA, DECEMBER 31, 1957

| Component— | British Columbia | Alberta | Saskatchewan | Total |
|---|---|---|---|---|
| Propane, barrels × $10^6$ | 4.8 | 170 | 19.3 | 194.1 |
| Butane, barrels × $10^6$ | 8.3 | 166 | 12.9 | 187.2 |
| Pentanes plus, barrels × $10^6$ | 17.2 | 290 | 7.8 | 315.0 |
| Total liquids, barrels × $10^6$ | | | | 696.3 |
| | | | | say 700.0 |
| Sulfur, long tons × $10^6$ | 2.7 | 50 | 0.1 | 52.8 |
| | | | | say 50 |

being marketed locally. With the completion of the Westcoast Transmission Co., Ltd., and the Trans-Canada Pipe Lines, Ltd., large diameter lines to the West Coast and eastern Canada respectively, plant construction is proceeding in the majority of the fields scheduled to supply gas to these lines. As a result of the rigid hydrocarbon dew-point specifications required by the pipeline companies, most of the gas purchased including that from so-called dry-gas fields will require some processing.

Table 3 shows gas-processing plants which are presently operating or are scheduled to be in operation by November 1, 1958. The table shows the plant location, plant owner, nominal capacity in terms of pipeline gas and a check list of the types of byproducts being manufactured. The data has been compiled from published information where possible and is believed to be accurate. It indicates that present plant capacity totals some 1,100 million cubic feet per day. Plans for plant construction for the processing of gas in other known fields could double this figure within the next 5 years.

### Processing-Plant Byproducts

From production reports filed by gas-processing plants in Alberta, from available gas analyses and from various published reports, data has been compiled whereby an estimate of the current reserves of plant byproducts may be made. Table 4 is a summary of the estimated reserves as of December 31, 1957, consistent with the reserves of natural gas shown in Table 1.

The reserves have been estimated, where actual plant-performance data are not available, by assuming recoveries from the raw gas streams of 50% propane, 90% butanes, and 100% pentanes and higher hydrocarbons. In the case of gas-condensate fields, estimated condensate production has been included in the pentanes-plus figure.

It would be much too hazardous to attempt to predict with any degree of accuracy the annual rates of production of plant byproducts. There is a wide variation in the analyses of the various reserves of gas which will require processing. The plant construction schedules will of course depend on the finding of additional outlets for the residue gas and on pipeline construction. However, if we wish to exercise our imagination a little more, a very rough estimate can be made.

If we assume that the ratio of liquid-hydrocarbon and acid-gas components to total gas reserves, will on an average remain constant, the upper curve of Fig. 4 may be used. By assuming a 25-year uniform rate of production for the byproducts associated with the presently established reserves and for reserves to be discovered in the future, suitable scales may be placed on the ordinate of Fig. 4, giving a direct conversion of estimated gas production to estimated liquid hydrocarbon and sulfur production by years. The graph indicates that in the year 1982 the annual production of liquid hydrocarbon and sulfur could be as great as 135 million barrels and 10 million long tons respectively. This compares to the current United States production of some 300 million barrels and 7 million long tons respectively.

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3. Before the Royal Commission on Energy, a submission by British-American Oil Co., Ltd., Feb. 1958.
4. Bulletin of AAPG, Vol. 34, No. 10, pp. 1947-1953, Oct. 1950.
5. Bulletin of AAPG, Vol. 42, No. 2, pp. 431-438, Feb. 1958.
6. The Oil and Gas Journal, Vol. 56, No. 4, pp. 159-160, Jan. 27, 1958.
7. "Petroleum and Natural Gas Conservation Board Report to the Lieutenant Governor in Council," Mar. 1952.
8. "Petroleum and Natural Gas Conservation Board Report to the Lieutenant Governor in Council," Mar. 1952.
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10. "Natural Gas Reserves of the Province of Alberta and Other Related Data," Jan. 1957.
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12. Bulletin of AAPG, Vol. 28, No. 6, pp. 701-711.


DRILLING

# Two devices protection

THERE IS TODAY plenty of good equipment for use in preventing blowouts. In fact, the equipment is good enough that it can very seldom be blamed for a blowout. The opinion of experts in the field is that 95% of all blowouts result from human error. In spite of the excellent equipment and precautionary measures, blowouts still occur.

Because of this, Creole Petroleum Corp. started a program aimed at better blowout control and prevention. First, attention was given to better primary blowout prevention and to drilling and completion fluids. Then, emphasis went to developing better equipment for bringing wild wells under control after blowouts start.

In practically every blowout, closure devices are tailored from existing equipment to fit the situation. This often requires valuable time and at best is an improvision. For this reason, and based on past experience, Creole felt it needed blowout-closure equipment designed for broad application. Creole's work is a pioneering effort to prepare flexible emergency equipment and have it on hand before a blowout starts.

To achieve its aims, Creole arranged for cooperative work with the Jersey Production Research Co. Work in the development phase was in two channels. Since the majority of Creole's wells are in Lake Maracaibo, one approach considered going underwater to close in a blowout. However, this idea was abandoned because of the apparent complexity of proposed equipment and safety considerations. The remaining approach was one concerned with surface devices. Two distinctly different, but equally effective tools were developed.

### Stinger Closure Device

The first tool was an insert type designed and manufactured by Baker Oil Tools, Inc., based on a Jersey patent.

Fig. 1 shows the basic principle of the insert tool, labeled the "stinger."


Presented at the eighteenth annual meeting of the American Association of Oilwell Drilling Contractors in Dallas, October 1-3, 1958.

# may provide from blowout

BY W. E. HARRELSON
Creole Petroleum Corp.,
Tia Juana, Estado Zulia, Venezuela
and
JOHN E. ORTLOFF
Jersey Production Research Co., Tulsa

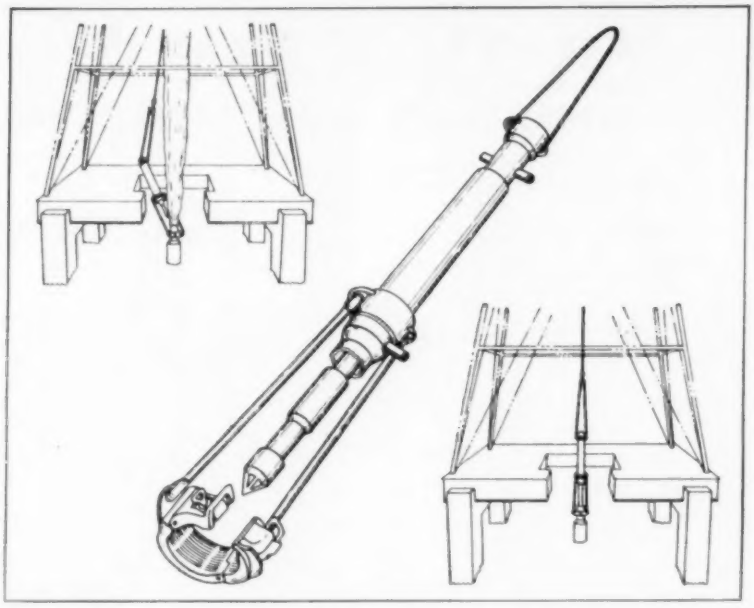
The stinger is a double-acting cylinder with a packer attached to the end of the piston rod. It attaches to the well from the side, out of the path of the blowing stream. After the tool is raised to a vertical position, hydraulic pressure on the top of the piston moves the packer into the well. And, the packer shuts off well flow.

Fig. 2 shows the insertion unit in greater detail. The assembly is attached to the well casing by slip-type elevators and elevator links. Where a shoulder such as a wellhead or a casing collar is available, the smaller and lighter shoulder-type elevator is preferable. An alternate method of anchoring the tool to the well is use of special brackets and wire-line slings. In Fig. 2 the tool is in alignment with the well bore, ready for insertion.

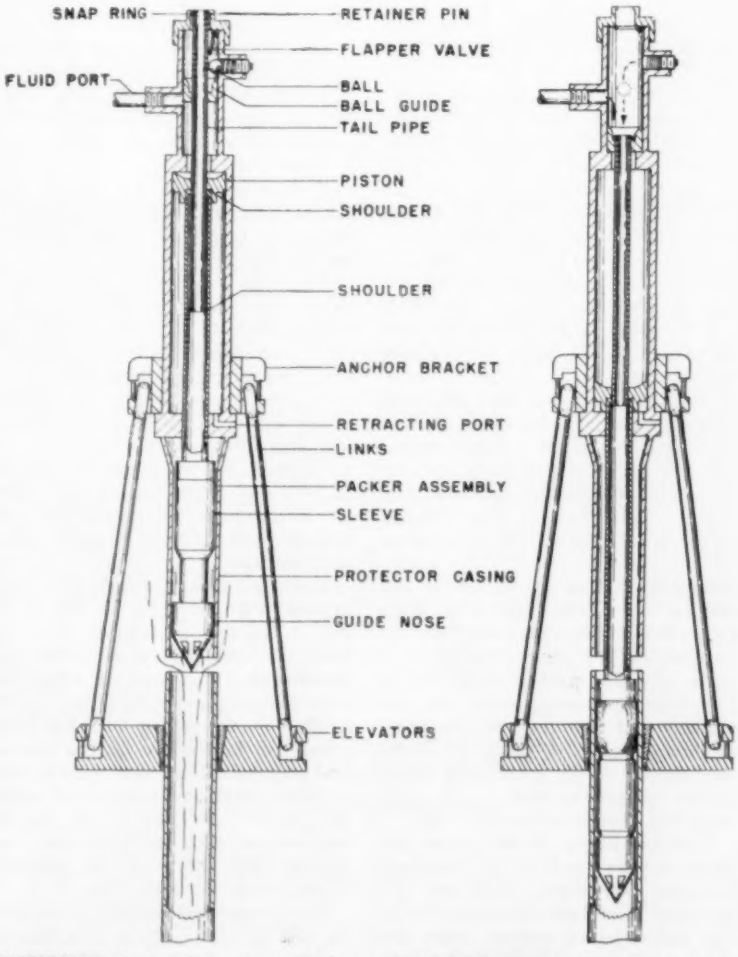
**What pressure does . . .** After the stinger is aligned, fluid pumped into the side outlet at the top of the cylinder will move the piston down, forcing the packer into the well casing. Note that the piston rod is hollow and permits part of the well flow to pass through the piston rod and tail pipe. Remainder of the flow from the well passes between the packer and the casing bore.

As the piston moves down, it slides on the tail pipe. Near the end of the stroke, however, the piston contacts a shoulder on the tail pipe. Through the remainder of the stroke, the tail pipe moves with the piston. As Fig. 3 shows, the tail pipe moves past a spring-loaded flapper valve which closes and stops the flow through the tool. With the flapper valve closed, well flow coming through the piston rod then will be diverted to the top of the piston and will help to force the packer into the well.

The tail pipe in its downward movement also releases a spring-loaded ball which falls into the end of the tail

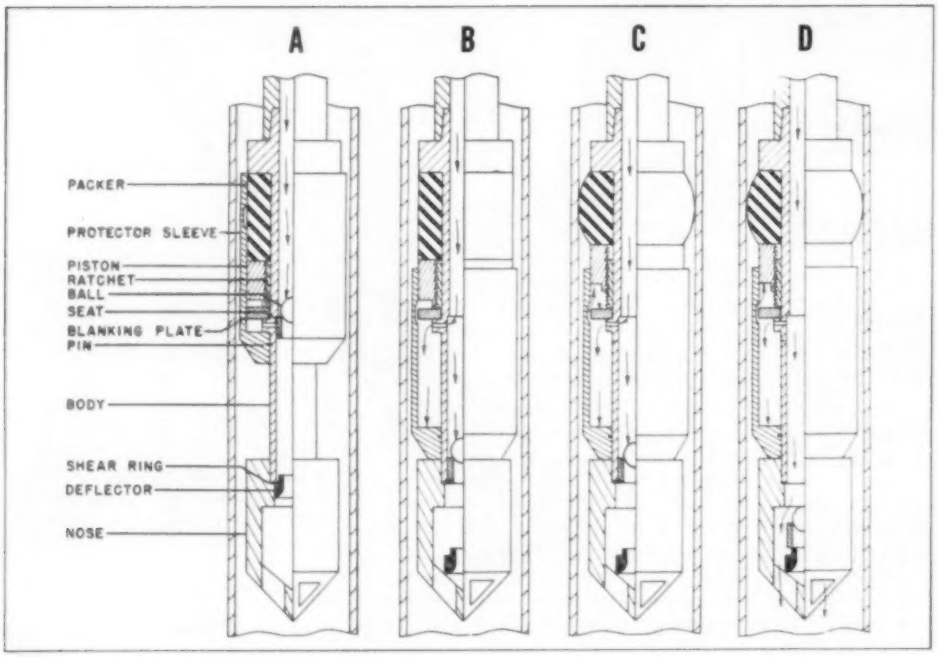


**ACTION** of the insert-type closure device. This is called the "Stinger." Fig. 1.




**INSERT-TYPE** closure device is ready for insertion. Fig. 2.

**AFTER INSERTION,** the stinger looks like this. Fig. 3.




**PACKER** setting sequence. Fig. 4.

pipe. Continued pumping moves this ball against a seat in the bore of the packer.

Fig. 4 shows the packer-setting sequence after the ball has seated. In Fig. 4-A, the ball has moved against the seat which is held in place by friction of the O-rings. In Fig. 4-B, the pressure behind the seat ball has moved the ball and seat down against a 1,000-psi. shear ring and has knocked out the fluid deflector. The fluid deflector has protected the shear ring from the stream flowing through the center of the packer during the insertion process.

Note that the end of the guide nose is tapered for easy entry into the well bore. Openings in the guide nose permit entry of the well fluid, but are not large enough for the fluid deflector to pass through. Thus, the deflector is retained by the guide nose.

**Setting the packer . . .** After the ball and seat move down against the shear ring, ports in the packer body are uncovered and fluid moves through these ports into the packer cover sleeve. Continued pumping builds up the pressure and shears a protector sleeve retaining pin. The protector sleeve then moves off the packer and comes to rest against the back of the guide nose. Fig. 4-B illustrates this step.

With the sleeve off the packer element, as shown in Fig. 4-B, continued pumping will move fluid past the blanking plate into the space behind the packer-setting piston. Note that the internal groove in the cover sleeve is now located over the blanking plate. Before the sleeve moved off the packer, a seal (not shown) between the blanking plate and the bore of the cover sleeve prevented fluid from flowing into the space behind the packer piston. With the sleeve off, however, fluid pressure builds up behind the piston, moves it against the packer and compresses the packer against the inner wall of the well casing. At this point, the well is shut in.

A ratchet ring in the piston then retains the packer in the expanded position and makes it independent of the pump pressure. Fig. 4-C illustrates the setting of the packer.

Continued pumping after the packer is set will shear the bottom retainer ring and cause the ball and seat to move into the guide nose as shown in Fig. 4-D. With the ball and seat out of the way, fluid can be pumped into the well to bring it under complete control.

Once the tool is attached to and aligned with the well, as shown in Fig. 1, all that remains is to pump fluid into the inlet port at the top of the tool. Operations are automatic after pumping starts. By proper manifolding of the piping into the tool, water can be used to set the packer and mud to kill the well without loss of time. Total time required to insert the packer and close in the well is approximately 15 to 20 seconds, assuming that the tool is properly aligned with the well bore.

The stinger and packers to fit 5½-in., 6⅝-in., 7-in., 8⅝-in. and 9⅝-in. casing sizes have been shipped to Creole.

The second of the two surface devices developed was a combination wrap-around and overshot closure device. It was designed and developed by the McEvoy Co. based on an idea of Jersey.

The latching-type overshot has two basic parts; a wrap-around slips and seal assembly and a pressure caisson. The wrap-around unit is installed from the side and grips the casing. Latches then lock the two hinged parts together around the casing. With the wrap-around properly assembled and installed in the well casing, the overshot will latch automatically to the wrap-around when lowered over it.

The overshot has a blind-ram preventer flanged to its top. Closing the blind-ram preventer then brings the well under control. Side outlets in the neck of the pressure vessel permit pumping in fluids to kill the well.

Fig. 5 shows schematically the two basic parts of the device. Referring to Fig. 5, the wrap-around assembly is made in two sections and is hinged so it can be installed on the casing from the side. Two latches lock the hinged sections together around the casing. The hinges are located at 180° from the latches and therefore do not show in Fig. 5.

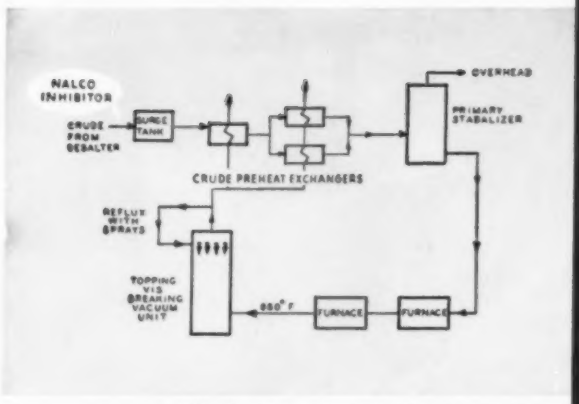
The wrap-around assembly contains two sets of slips; the upper set supports the weight of the wrap-around and the overshot; and the lower set resists the upward pull on the casing after closure.

About midway down from the top of the wrap-around is a series of spring loaded latching dogs which lock the

# Nalco INHIBITORS STOP CORROSION and FOULING

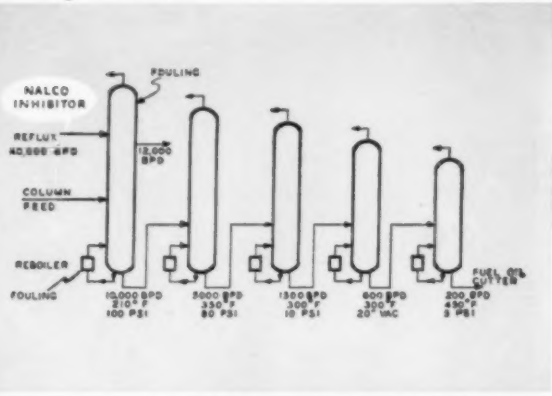
## Every Step of the Way

HERE are four typical stages of refinery production where Nalco Inhibitors stop corrosion and fouling. There are many others, too. In fact Nalco Inhibitors are effective every step of the refinery way. Ask your Nalco Representative or write direct.



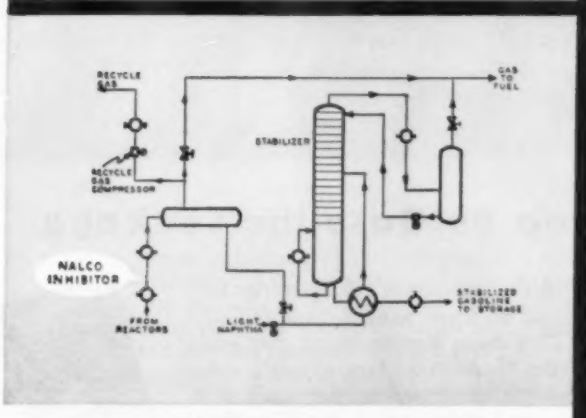

**CRUDE PREHEAT EXCHANGERS**

*The Problem:* Fouling. *The Treatment:* 15 ppm of Nalco Inhibitor. *The Results:* Normal temperatures regained in exchangers after five weeks of treatment. Actual reduction of 4 days of downtime due to cleaner condition of treated units.



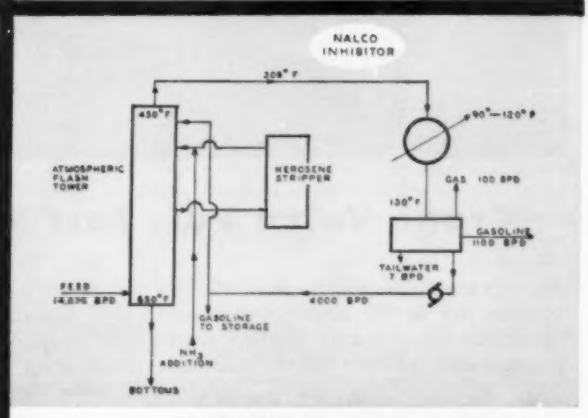

**ALKYLATION SYSTEM**

*The Problem:* Reboiler fouling. *The Treatment:* Nalco Inhibitor fed to reflux of left tower. *The Results:* No water washing or mechanical cleaning of system needed after full year of operation. Refinery costs and inconvenience reduced considerably. Greater production realized.




**PLATINUM REFORMING UNIT**

*The Problem:* Severe corrosion of exchangers and accumulator after the reactors due to an unusually high halogen acid contamination which held pH about 1.3. *The Treatment:* Nalco Inhibitor into reactor effluent. *The Results:* Iron content reduced from 13.9 to low of 0.73 lbs. per day, far lower than with other inhibitors at greater dosage.




**DELAYED COKING UNIT**

*The Problem:* Corrosion of overhead condenser, accumulator and stream pumps. Small amounts of iron sulfide "scaling" in flash tower. *The Treatment:* Nalco Inhibitor added to overhead stream. *The Results:* Iron content of tail water reduced from 300-1000 ppm to approximately 1-20 ppm. Corrosion and scaling stopped.

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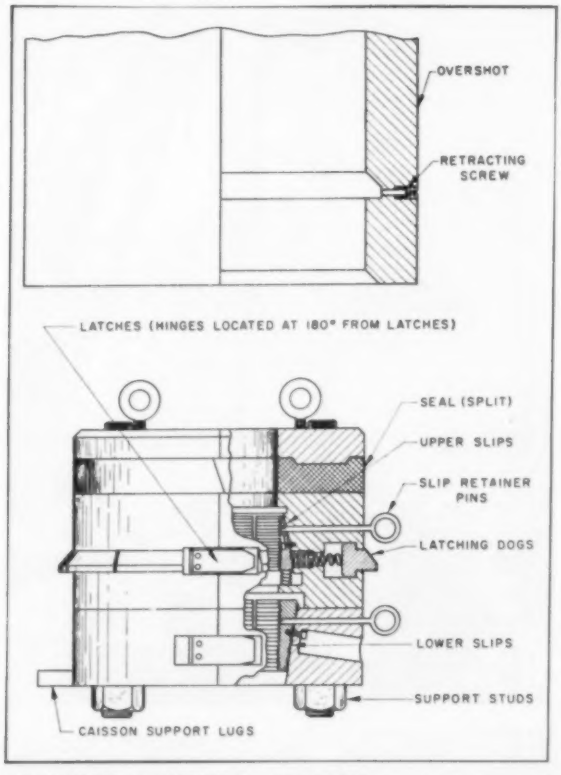
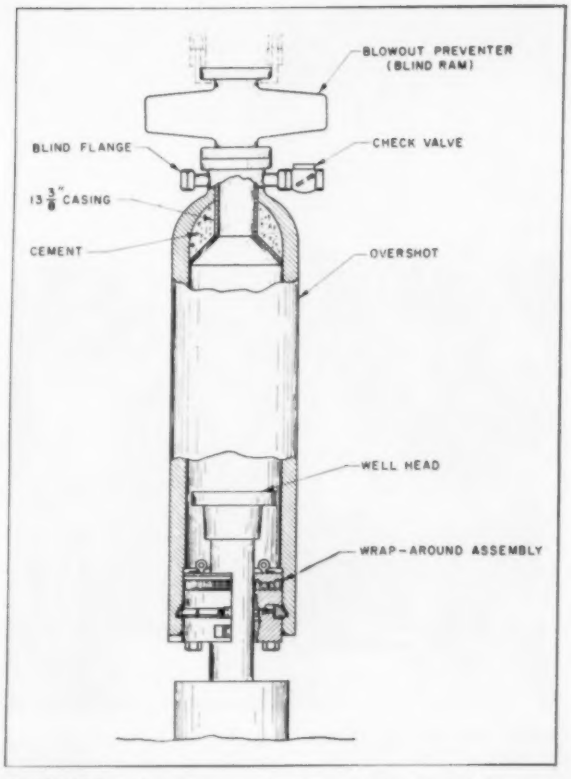



**WRAP-AROUND ASSEMBLY OVERSHOT** and wrap-around closure device. Fig. 5.




**OVERSHOT** and wrap-around closure device installed on a well. Fig. 6.

caisson to the wrap-around. Fig. 5 shows the lower end of the pressure caisson above the wrap-around assembly.

**As installed . . .** Fig. 6 shows the wrap-around assembly installed on the surface pipe below the wellhead and above the conductor pipe. The pressure caisson with blind-ram preventer is shown latched to the wrap-around. At least 24 in. of clear space is required for proper installation of the wrap-around assembly. If this amount of space is not available, it may be necessary to strip the top of the conductor pipe and chip away the cement before installing the wrap-around. The overshot closure device was designed for use as shown in Fig. 6 but is not limited to this particular installation.

Figs. 7 and 8 show the device installed on straight pipe during a hydrostatic pressure test in Houston. In Fig. 7, the wrap-around assembly has been installed on the pipe and the pressure caisson is being lowered in place over the wrap-around. In Fig. 8, the overshot has been latched to the wrap-around assembly on the pipe. In actual practice, a blind-ram blowout preventer would be installed at the top of the pressure caisson.

The overshot closure device was designed to operate at 5,000-psi. working pressure. The pressure caisson will clear a 24-in.-diameter wellhead. Eight wrap-around assemblies make this tool adaptable to pipe sizes ranging from 5½-in. diameter through 13⅜-in. diameter.

Approximate weight of the pressure caisson is 15 tons; each wrap-around weighs around 1½ tons. Over-all length of the caisson with blind-ram preventer is about 22 ft.

The overshot assembly with eight wrap-around assemblies was shipped to Creole in the Tia Juana district. The entire assembly was thoroughly tested and checked in Houston before delivery.

### Testing and Training

After development of the tools, there was a program for field adaptation at Tia Juana. Its purpose was to:

1. Set up and carry out a program to test the stinger and the overshot.
2. Set up and carry out a program to train personnel in the operation and maintenance of the equipment.

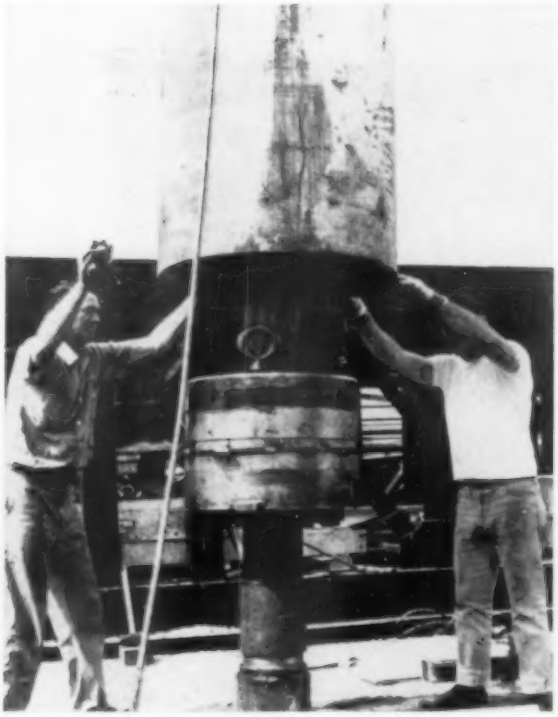
The testing program included operational sequence tests of the stinger device and the five packer assemblies. These tests consisted of pumping water into the tool to check the operation of the insertion device and the packers.

The stinger assembly was also tested under simulated blowout conditions on a Creole training rig at Lagunillas. Fig. 9 shows the assembly attached to the well and out of alignment with the well bore. Elevators and links were used to attach the tool to the well.

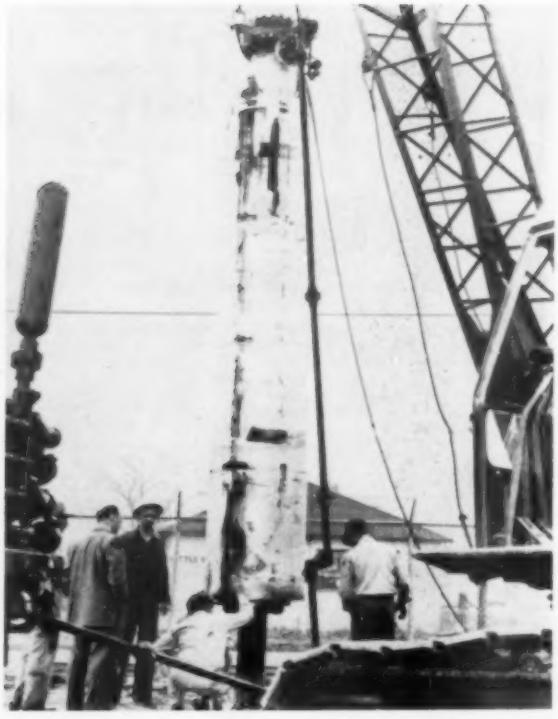
In Fig. 10 the piston has moved the packer into the well casing and water coming from the casing is spraying in all directions. In this illustration, the flapper valve at the top of the device has closed and all of the flow from the well is coming out of the casing around the packer. Fig. 11 shows the tool after the packer has set and stopped the flow.

Actual time required for the sequence of the operation, shown in the last three figures, was about 15 seconds. In this test, water was pumped through the casing at the rate of approximately 250 g.p.m. The pressure relief valve on the pump was set at 2,500 psi. and sheared immediately upon closure of the well.

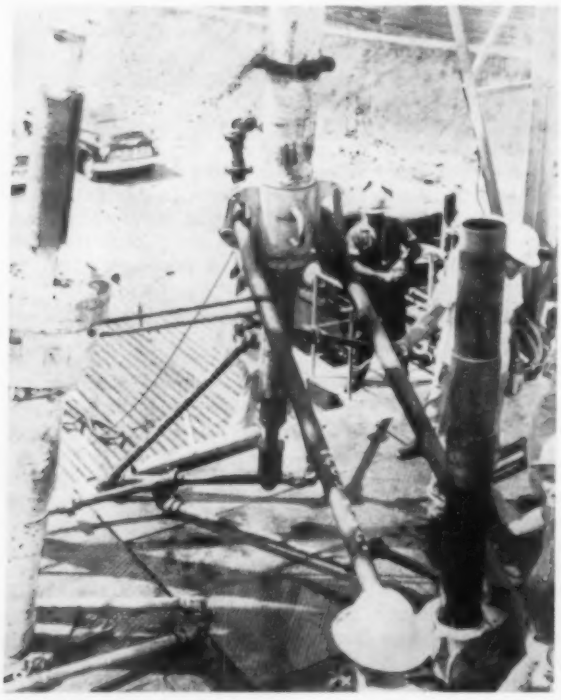
In addition to the test of the stinger at Lagunillas, other tests were made under simulated blowout conditions for both the stinger and the latching overshot. For these tests, an abandoned well site was chosen. A workover barge provided the pumps for simulating blowout conditions and for operation of the closure device. A



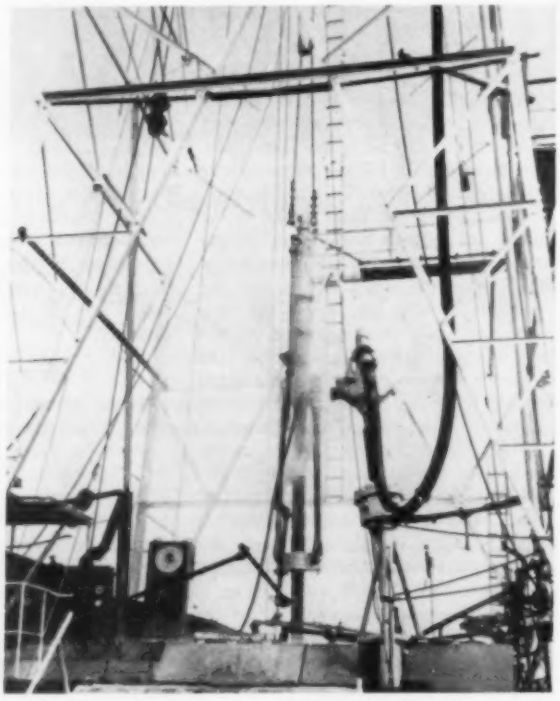
**WRAP-AROUND ASSEMBLY** installed on casing. Pressure caisson is being lowered in place over the wrap-around. Pressure caisson will clear a 24-in. wellhead. Fig. 7.



**OVERSHOT** is latched to the wrap-around assembly on the pipe. Overshot device is designed to operate at 5,000-psi. working pressure. Wrap-arounds vary in size. Fig. 8.

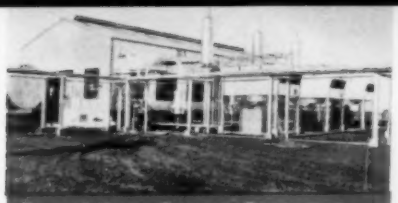


**INSERT-TYPE ASSEMBLY** attached to the well, out of alignment with the well bore. Elevators and links are used to attach tool to the well. Fig. 9.

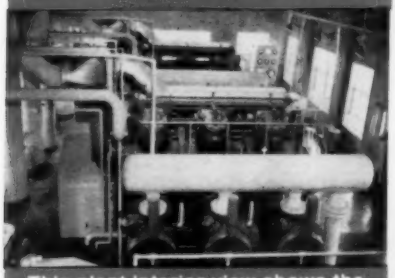


**DURING INSERTION** under simulated blowout conditions, piston has moved the packer into the well casing and water is spraying in all directions. Fig. 10.

# PAST PERFORMANCE PICKS COOPER-BESSEMER

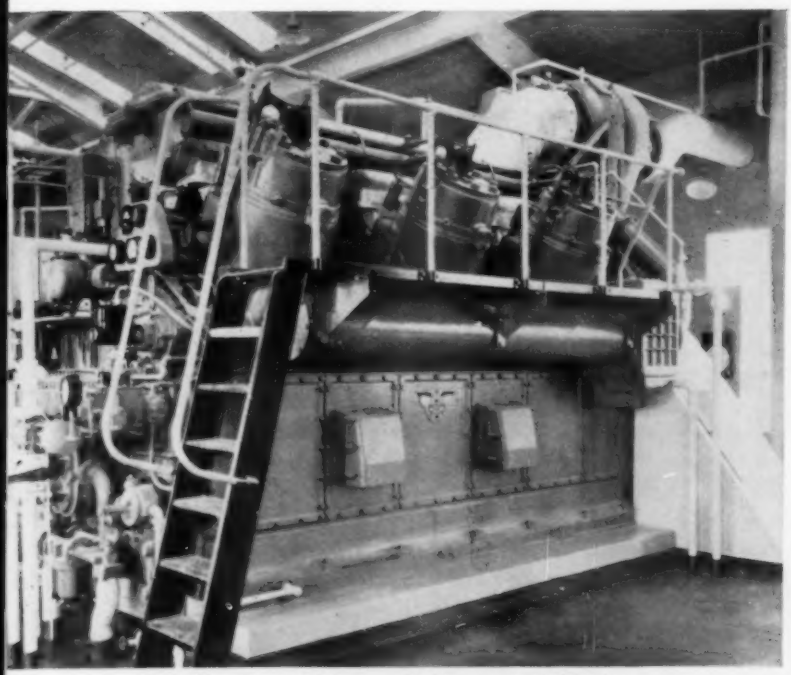


One of three Cooper-Bessemer 6-cylinder GMVC supercharged compressors in the Coleville station.



This plant interior view shows the neat, compact arrangement of Cooper-Bessemer compressors at Coleville.

## *for Saskatchewan's first natural gas compressor station*



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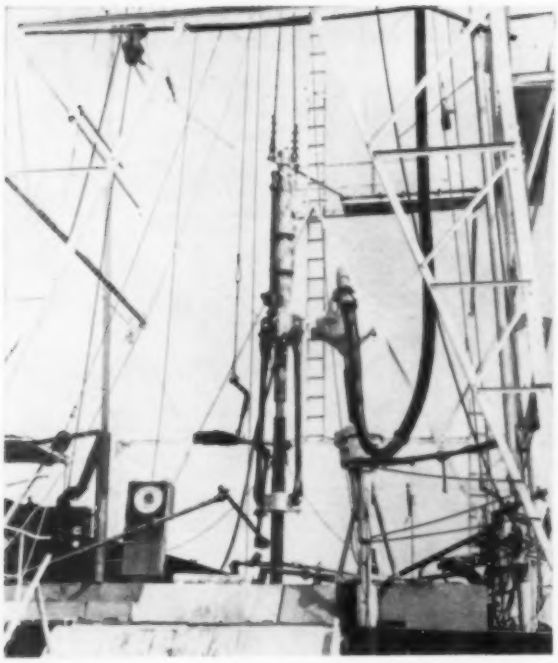


PACKER HAS SET and flow has stopped. Time required for the actual closure operation is about 15 seconds. Fig. 11.

HYDRIL OVERSHOT ASSEMBLY was used by Creole to close in a blowout, by turning it upside down, and using a spook to tie it to a blind-ram preventer. Fig. 12.

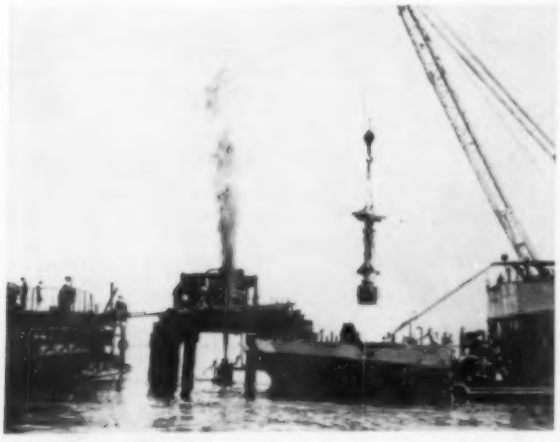
crane barge was used to handle the closure devices.

**Upside-down preventer . . .** In addition to the stinger and the overshot, a third device was tested. This tool which is also an overshot, was built by Creole and used to close in a blowout in late December 1955. It consists of a 20-in. Hydril blowout preventer turned upside down, a blind-ram preventer and a spool tying the two preventer together. Side outlets permitted pumping in well-killing fluids. This device is shown in actual use in Figs. 12, 13, and 14.

In tests at an abandoned well site the tools operated satisfactorily. In two series of tests, the stinger, the latch-type overshot and the Creole device closed in simulated blowouts.

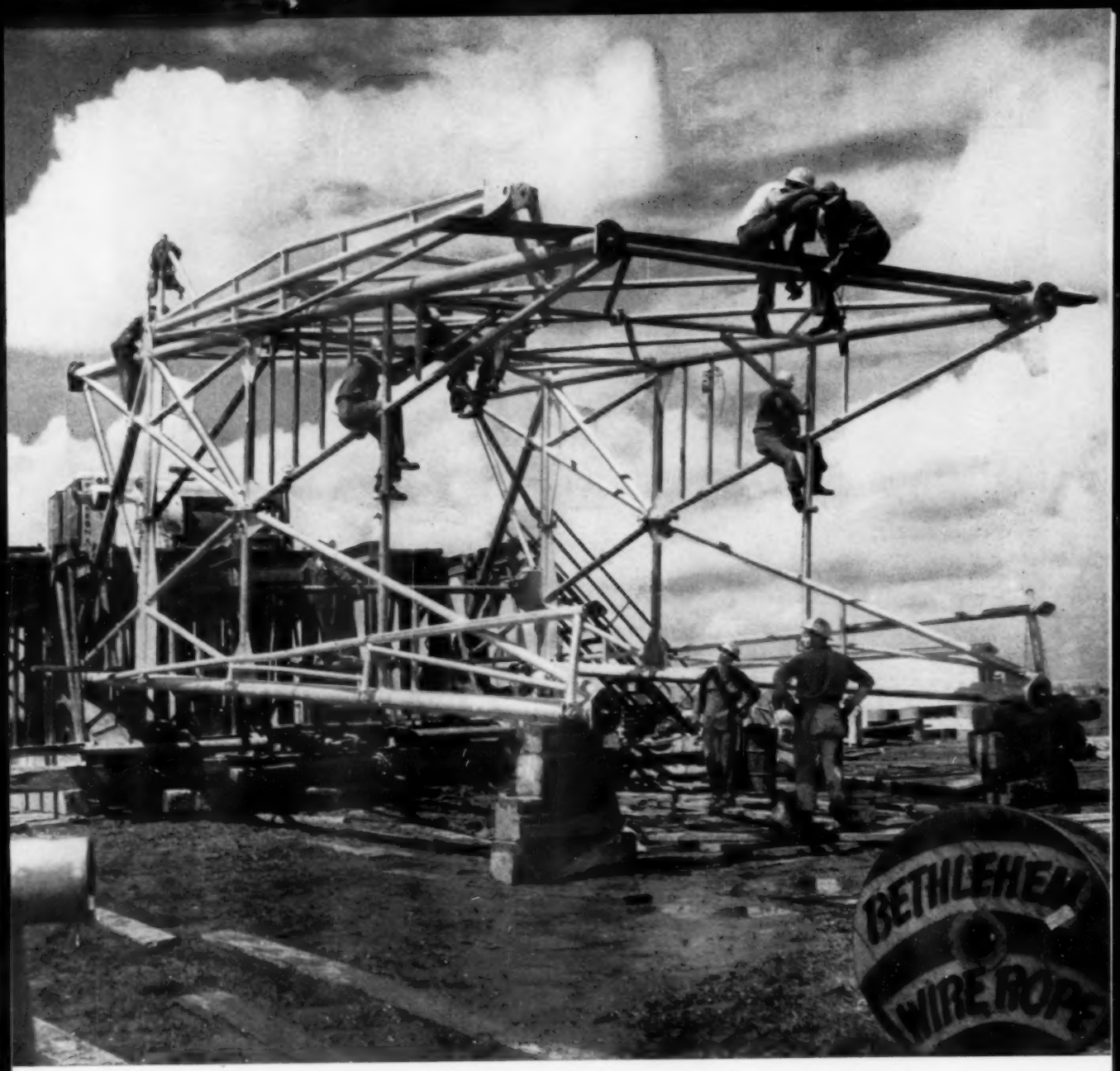
**Three-part program . . .** The training program was set up to train personnel in blowout control and prevention and was divided into three parts. The first part of the program consisted of a classroom lecture on procedures and safety in blowout control work. In addition to the lecture, movies of blowouts were shown.

The second part of the program included the actual testing and demonstration of the devices. These tests, just described, were carried out under realistic field conditions. The third part of the program was training selected personnel to service and maintain the special tools. All men taking the course received a comprehensive training manual covering all three phases of the program.



PLACING THE ASSEMBLY was done by crane. Side outlets permitted pumping in well-killing fluids. Fig. 13.

IN PLACE, the Hydril assembly is ready for closure by using the blind-ram preventer. Fig. 14.




**Moving day for the workover outfit.** Moving a workover rig is a task requiring skill, coordination, teamwork. But the crew can take it in stride, for a portable outfit is mobile as a circus and is handled in the same efficient way. This picture shows a rig being moved off a typical flowing well in southern Louisiana.

The workover specialists had just finished servicing the well, which was over 10,000 ft deep. The job of pulling and rerunning tubing was done with the rotary line, a Bethlehem Purple Strand rope with IWRC. Purple Strand was also the choice of the trucking firm engaged to load and move the rig. In both cases, the ropes were Form-Set (preformed) to insure good spooling and resistance to kinking.

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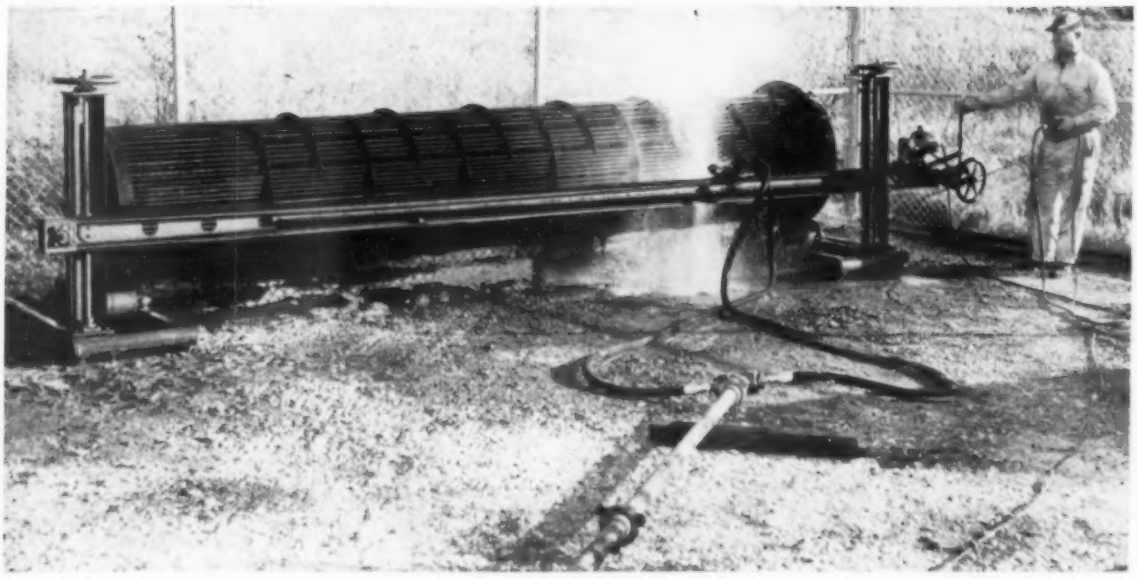

# A different kind of bundle cleaner

## *has a movable head that delivers high-velocity water jets at 3,000 psi.*

A JETTING TOOL for cleaning heat-exchanger tube bundles, developed by Dowell Division of The Dow Chemical Co., removes many deposits which could not be removed satisfactorily by other methods.

Various jet heads are used which deliver 65 g.p.m. to 175 g.p.m. at 3,000 psi., depending upon the pumping equipment employed. The number and size of jet orifices used with the jet head can be selected to provide maximum efficiency according to the nature of the deposits encountered.

**Bundle cleaner . . .** The bundle cleaner consists of a hydraulic jetting head which is fastened to a movable beam that extends between two bases. This jet head is mounted on a trolley that is propelled along the supporting channel beam by a motor.

The tube bundle rests on flanged rollers located at each end of the bundle-cleaner unit. These rollers permit the bundle to be rotated so that it can be jetted from different directions. The flanged rollers can be positioned at various distances from the jet head to accommodate bundles of different diameters.

**Cleaning cycle . . .** In operation, an electric motor moves the trolley mounted hydraulic jet head back and forth along the beam. The motor also raises or lowers the entire beam assembly either 1¼ or 2½-in. during each round trip of the trolley from one end of the beam to the other.

Thus the jet head covers the entire vertical area of the bundle being cleaned. A complete cleaning cycle from top to bottom of a 36-in. bundle requires 16 minutes using the 2½-in. feed. Slightly more than an hour is required to jet a bundle this size four times, rotating it 90° between each cleaning pass.

With many bundles, the entire jetting operation can be completed in about an hour and a half. This allows for jetting the entire vertical area of the bundle from four different directions, rotating the bundle 90° after each jetting. Badly fouled bundles may require as many as three or four jetting passes from each direction, in some cases requiring as long as 8 hours for cleaning.

**Asphalt deposits . . .** Further experimental work is now under way on problems of removing heavy asphalt or polymerized deposits. Asphalt is solid enough to resist the impact of high-velocity jets, yet resilient enough to absorb much of the energy of the jet streams. However, in many cases other deposits intermingled with the asphalt provide weak points which allow the water jets to enter and break away asphalt deposits. One bundle had deposits of fairly loose dry material. The bundle was 18 in. in diameter and 20 ft. long. Pitch of the brass tubes was so close that it was impossible to insert a knife blade between them. The high-pressure jetting tool cleaned the bundle so thoroughly that the cleaned tubes were a bright brass color.

A slurry reboiler exchanger bundle, 3 ft. in diameter and 16 ft. long, was fouled with deposits of coke and asphalt. One pass from each of four directions cleaned bundle thoroughly.

Another refiner had several bundles the refiner attempted to clean one of 3 ft. in diameter and 16 ft. long which were severely fouled with coke and asphalt deposits. The last time these bundles, it was necessary after expensive cleaning efforts, to discard the bundle. One of these bundles was jetted with the bundle cleaner. The refiner had sawed out deposits around the first few rows from one direction. After this bundle was jetted for about 8 hours, it was 95 to 98% clean.

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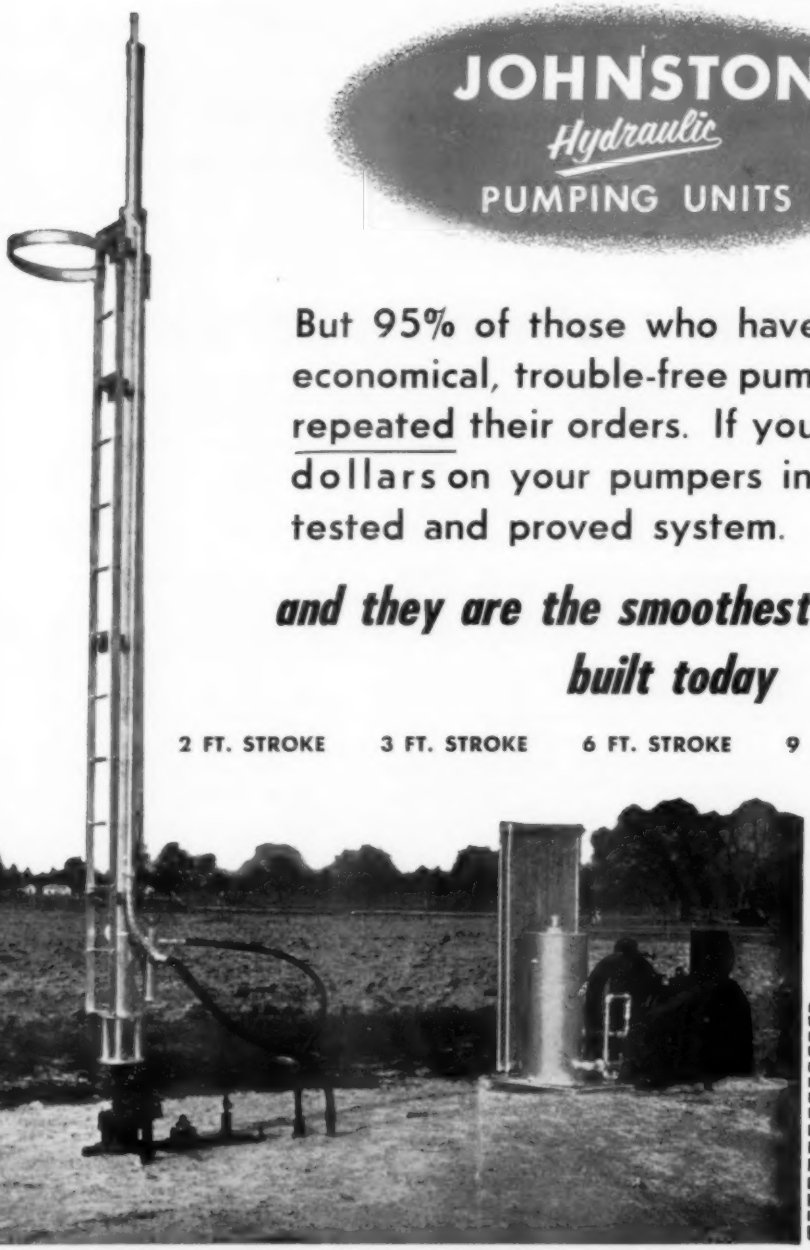

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BY E. T. GUERRERO
Head, Department of Petroleum Production Engineering, University of Tulsa

and

F. M. STEWART
Staff Engineer, Alex McCoy Associates, Inc.

# 1. How to determine effective porosity

## (a) Using a Washburn-Bunting porosimeter

GIVEN: Data obtained on a sandstone sample using a Washburn-Bunting porosimeter and calipers were as follows:

| | |
|---|---|
| Volume of air removed from the interconnected pores and surfaces, cc. | 3.3 |
| Volume of air adsorbed on glass and core surfaces, cc. | 0.6 |
| Diameter of core, cm. | 1.9 |
| Length of core, cm. | 3.8 |

FIND: Effective porosity of the core.

METHOD OF SOLUTION: The following equations are used:

$$\text{Per cent porosity} = \frac{\text{Pore volume}}{\text{Bulk volume}} \times 100 \quad (1)$$

$$\text{Pore volume} = \text{total volume air removed} - \text{volume air adsorbed on surfaces} \quad (2)$$

$$\text{Bulk volume} = \pi r^2 L \quad (3)$$

Where:

r = radius of core, cm.

L = length of core, cm.

SOLUTION:

$$\text{Pore volume} = 3.3 - 0.6 = 2.7 \text{ cc.}$$

$$\text{Bulk volume} = (3.14)\,(1.9/2)^2\,(3.8) = 10.8 \text{ cc.}$$

$$\text{Per cent porosity} = (2.7/10.8) \times 100 = 25.2$$

DISCUSSION: This method of effective porosity determination is based on the ability of the apparatus to directly measure the gas contained by the pores of a sample. The gas is expanded from the pores and measured at atmospheric conditions.[1,2] Results obtained are considered accurate when care is taken to properly calibrate the apparatus for gas adsorbed on the glass and sample surfaces. Since the apparatus is constructed of glass, the method is restricted to laboratory use. The measurements are made fairly rapidly and the sample is contaminated with mercury during the test. Fairly small samples (½, ¾, or ⅞ in.) are used in the procedure.

## (b) Using flood-pot data

GIVEN: A sample taken from the Bartlesville sand in Greenwood County, Kansas, was placed in a flood pot and water flooded for 12 hours. At the end of this period it was placed in a high-pressure container and subjected to 1,000 psig. mercury pressure. By means of a mercury pump it was observed that 0.15 cc. of mercury entered the core and that the bulk volume was 7.2 cc. The core was then placed in a retort and the following data obtained:

| | |
|---|---|
| Volume of water extracted | 1.10 cc. |
| Volume of oil extracted | 0.30 cc. |

FIND: Effective porosity and fluid saturations after flooding.

METHOD OF SOLUTION: Applying Equation 1 to the recovered fluids:

$$\text{Per cent porosity} = \frac{\text{Vol. gas} + \text{vol. oil} + \text{vol. water}}{\text{Bulk volume}} \times 100 \quad (4)$$

For each of the three fluids, the per cent saturation is found by:

$$\frac{\text{Volume of fluid}}{\text{Pore volume}} \times 100$$

SOLUTION:

$$\text{Per cent porosity} = \frac{0.15 \text{ cc.} + 0.30 \text{ cc.} + 1.10 \text{ cc.}}{7.2 \text{ cc.}} \times 100 = 21.5$$

$$\text{Per cent oil saturation} = \frac{0.30 \text{ cc.}}{1.55 \text{ cc.}} \times 100 = 19.3$$

Per cent water saturation

$$= \frac{1.10 \text{ cc.}}{1.55 \text{ cc.}} \times 100 = 71.0$$

Per cent gas saturation

$$= \frac{0.15 \text{ cc.}}{1.55 \text{ cc.}} \times 100 = 9.7$$

DISCUSSION: Flood-pot tests are performed to determine the ability of water to displace additional oil from a partially or primary depleted sand. The test involves the radial injection of water into a core with fluid production obtained from a hole drilled in the center and throughout the entire length of the core. Provisions are made to trap and measure any oil displaced. After a flood-pot test is completed, most of the pore space in the core is filled with water and residual oil. A small amount of pore space may also be filled with gas. The latter can readily be measured by means of mercury injection under high pressure. Subsequent retorting of the sample will yield the fraction of the pore volume occupied by oil and water.

This method of porosity and fluid-saturation determination is considered reliable if the retorts are carefully calibrated for oil losses due to coking and water losses and/or gains due to evaporation, and water of crystallization. Care must also be taken not to loose liquids from the core in the mercury chamber and to calibrate the chamber and mercury pump for expansion under pressure.

## (c) Using retort and mercury injection data

GIVEN: Two test samples were taken from adjacent positions of fresh Oklahoma Squirrel sandstone cores. Mercury was injected into sample No. 1 while sample No. 2 was retorted. The following data were obtained on the two samples:

| | |
|---|---|
| Sample No. 1: | |
| Bulk volume, cc. | 13.68 |
| Weight, g. (before mercury injection) | 32.50 |
| Vol. mercury injected, cc. | 0.73 |
| Sample No. 2: | |
| Weight, g. | 120 |
| Corrected volume of liquids extracted: | |
| Oil, cc. | 1.00 |
| Water, cc. | 3.80 |

FIND: Effective porosity and fluid saturations of the fresh core.

METHOD OF SOLUTION: Additional equations needed for this method are:

$$\text{Bulk density of core} = \frac{\text{Wt. of sample}}{\text{Bulk vol. of sample}} \quad (5)$$

$$\text{Bulk volume of sample} = \frac{\text{Wt. of sample}}{\text{Bulk density of core}} \quad (6)$$

SOLUTION:

Bulk density of core

$$= \frac{32.50 \text{ g.}}{13.68 \text{ cc.}} = 2.38 \text{ g./cc.}$$

Bulk volume Sample 2

$$= \frac{120}{2.38} = 50.4 \text{ cc.}$$

Volume of gas in Sample 2

$$= 0.73 \text{ cc.} \times \frac{120 \text{ g.}}{32.5 \text{ g.}} = 2.70 \text{ cc.}$$

Per cent porosity (Sample 2)

$$= \frac{2.70 + 1.00 + 3.80}{50.4} \times 100 = 14.9$$

Oil saturation (Sample 2)

$$= \frac{1.00}{7.50} \times 100 = 13.3\%$$

Gas saturation (Sample 2)

$$= \frac{2.70}{7.50} \times 100 = 36.0\%$$

Water saturation (Sample 2)

$$= \frac{3.80}{7.50} \times 100 = 50.7\%$$

DISCUSSION: Fluid saturation and porosity can be determined by this method in the field as well as in laboratory and is widely used.[3] It measures pore volume from a summation of the fluids contained in the pores. Volume occupied by oil and water is determined by retort extraction while volume occupied by gas is determined by mercury injection into a fresh sample obtained at a point adjacent to the sample used for retort extraction. Corrections are applied to retort readings for coking and cracking of the oil and for combined water recovered.

Samples several times the size of those used by most other methods are used and thus should give more representative formation porosity and fluid saturations. This procedure has been found to be of particular advantage in determining the porosity of samples containing shale which normally undergo shrinkage upon drying. Porosity determinations are claimed to be within 2% accuracy while the fluid-saturation-determination accuracy varies from 2% (water) to 5% (oil).

The method is accurate enough for almost any application. No error is involved due to salt deposition from the water content of the samples or due to loss of sand grains in handling. It should be noted, however, that the combined data of two adjacent samples are used. It is apparent that in some formations appreciable variations in porosity and fluid saturations will occur even between adjacent samples.

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1. "Engineering Fundamentals on Petroleum Reservoirs," manual, The Oil and Gas Journal, pp. 29-30.
2. Pirson, S. J., "Elements of Oil Reservoir Engineering," McGraw-Hill Publishing Co., second edition, 1958, pp. 36-37.
3. Core Laboratories, Inc., "Summary of Core-Analysis Procedures" prepared for API Subcommittee on Standardization of Core-Analysis Procedures.


# BOOKS

PROCEEDINGS OF INTERNATIONAL CONGRESS OF COMBUSTION ENGINES, ZURICH, 1957. Published by Swiss Association of Machinery Manufacturers, General Wille-Stresse 4, Zurich 27, Switzerland. 65 Swiss francs.

Proceedings of the congress contain the text of lectures, technical papers, and discussions presented during the fourth CIMAC conference.

WEST TEXAS ELECTRICAL LOG SERVICE CATALOG. Volume 3 (1958 Edition).

Compiled in this catalog are all the electrical and radioactivity logs released to the oil industry from January 28, 1957 through January 27, 1958. For easy reference the logs are listed by counties, by fields, and by wildcat and development wells covering the West Texas and New Mexico area.

Electrical Log Services, Inc. also maintains well-log services covering North and West Central Texas, the Texas and Oklahoma panhandles and adjoining areas, and the Four Corners area.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

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# Photogrammetry:

## new way to survey pipeline routes

MAURICE E. FULLER
Pacific Lighting Gas Supply Co.

A NEW TECHNIQUE recently used by Pacific Lighting Gas Supply Co. was photogrammetry to survey a pipeline route. By this method, lengths and bearings of lines were determined without putting surveyors in the field with chain and transit to measure the relationship between points along a right of way.

Like others in the industry, the company for some time recognized the usefulness of aerial photography in selecting a pipeline route, but the next step—an aerial cadastral survey—was not taken so readily. There was question regarding its accuracy, and it was not known whether all the information can be secured by a ground survey party could be obtained by photogrammetry.

The science of photogrammetry was developed and accepted earlier in Europe than in this country. The Swiss Department of Cadastral Surveys conducted tests flying at elevations ranging between 3,500 and 10,000 ft. above ground and achieved results with a mean error of ±6.6 in.

Presented at Pacific Coast Gas Association transmission conference, San Diego, 1958.

In the spring of 1957 Pacific had selected a preliminary route for a 34-in. gas pipeline, approximately 82 miles long, to be installed between Newhall and North Coles Levee, Calif. The route was marked on a series of aerial photographs secured from the United States Department of Agriculture. Stakes had been set at horizontal angle points. A study of the preliminary route indicated that approximately 100 parcels involving 90 owners would be crossed by the pipeline.

Ownership was varied, ranging from small privately held parcels to large ranches where monuments were infrequent. Elevation of the route reached a maximum of 4,500 ft. near the midpoint and dropped to about 1,000 ft. at each end. Where the route had not been put under cultivation it was lightly covered with oak woods or covered with dense brush 8 to 10 ft. high. The terrain along the route is classified below:

| Terrain— | Miles |
|---|---|
| Level, no high crops or brush | 40 |
| Rolling hills, lightly wooded or brush covered | 12 |
| Steep hills, brush covered | 25 |
| Rugged mountains, brush covered | 5 |

**TARGETS** were made of aluminum foil, crinkled to avoid blurring on the photograph, each leg being about 12 ft. long and 3 ft. wide. Fig. 1.

It was recognized that a survey by conventional field crews would encounter difficulties. Unless more than two crews could be put on the ground, it was estimated that 42 weeks would be required to complete a field survey.

Putting more crews on the job could be expected to shorten the time required but would involve the increased burden of coordinating their work. Because of the rugged terrain, there was concern over the accuracy that could be attained by ground parties. Suitable control monuments were at such a distance apart that it was felt considerable error might be introduced in a traverse between those points.

### Survey Requirements

From the company point of view the survey method selected had to be one which could permit accuracy so that there would be no future need to relocate the pipeline or secure additional right of way because of faulty survey work. The essential features necessary to accomplish this were:

1. The legal description must positively identify the route for title purposes.
2. The legal description had to contain all necessary information for a competent surveyor to locate the route on the ground.
3. The route described must be continuous.
4. The fee ownership of each parcel traversed had to be determined together with approximte footage of right of way on each.

Requirements of the job and field conditions indicated that consideration should be given to photogrammetry for the survey. Therefore, the company took bids for the work to be done by that method with three major requirements:

1. Any point along the route was to be located within 5 ft. of its true position.
2. Legal descriptions and drawings

were to be completed 16 weeks after start of work.

3. Lambert coordinates were to be determined for each horizontal angle point in the pipeline route, each control monument used, and each vantage point, using photogrammetric equipment capable of first-order accuracy.

The Lambert system referred to is a method of constructing maps representing with limited distortion the curved surface of the earth as a plane surface. The distortion, if not corrected, introduces at worst, a linear error of one part in 10,000. Since the relation between the earth's surface and the plane of a Lambert grid is a precise one that can be described mathematically, the distortion can be eliminated if that accuracy is necessary.

California is divided into seven zones under the Lambert system. These zones do not exceed 157 miles in the north-south dimension to keep the distortion within the limits described above. The fifth zone covered all of the area traversed by the proposed pipeline and provided a continuous network of coordinate values which avoided the usual problems of tying the survey into a series of unrelated surveys of record.

### Role of Company and Surveyor

The job was awarded to Pacific Air Industries of Long Beach, Calif., who was to perform the aerial photography and photogrammetry. The company subcontracted the work of establishing ground control, preparing legal descriptions and drawings to Aerial Control, Inc., of Woodland Hills, Calif. Under the agreement made with the surveyor, the company was to do the following:

1. Set targets on horizontal angle points.

2. Select vantage points at high locations (from which ground crews would later set construction stakes) and mark them with targets.

3. Provide a strip map of the approximate pipeline route.

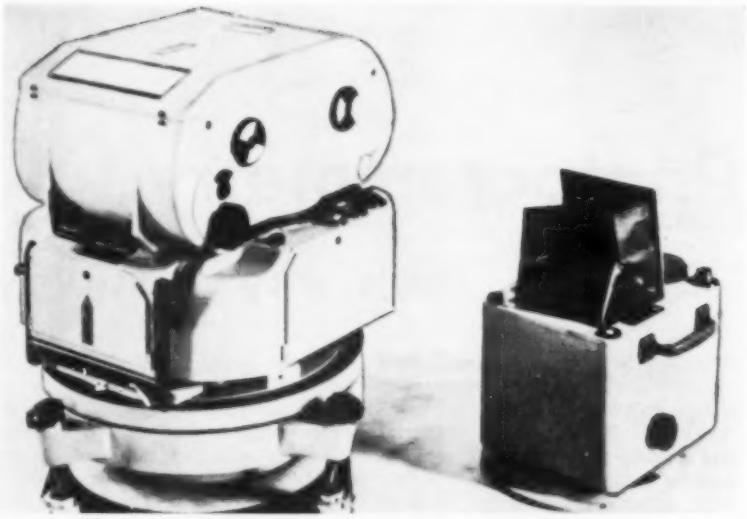
4. Secure lot book reports showing fee ownerships along the route.

5. Furnish parcel maps showing the approximate location of the pipeline route and the fee owners.

6. Provide a representative to work with the surveyors, identifying targets and making final decisions (when required) regarding changes in the route.

Preliminary work done by the surveyor prior to photography included the following:

1. Select U. S. Coast and Geodetic Survey monuments to be used in establishing ground control.



**FOR AERIAL SURVEY**, photographer used a Zeiss RMK 15/23 camera for photographs with little distortion. Pictures were taken at about 9,000-ft. altitude. Fig. 2.

2. Where such monuments were remote from the pipeline route, set temporary monuments adjacent to the route with third-order accuracy or better.

3. Select, locate, and target the points of record adjacent to the preliminary route.

### Photography Targets

Targets used had two shapes to identify the various points marked. At horizontal angle points in the route an "X" was placed on the ground with its center superimposed on the hub which marked the angle point. All other points to be photographed were marked with a "V" placed with its inside edges intersecting on the hub.

The frequency with which vantage points were set was governed by the terrain. This varied from eight per mile in a rough section to about two per mile in level country. Monuments were set so that approximately 30 miles of the route could be photographed in a single flight. It was found that the optimum flight length will be governed principally by the permanence of the targets.

Targets were made with various materials selected from their high reflecting value. The most satisfactory material was plaster of paris which was spread on the ground in the shape desired and sprinkler with water so it would set up. However, in windy locations the plaster of paris would blow away or lose definition before it could harden.

In such cases, aluminum foil on Kraft paper backing was used to good advantage. Experience showed foil would reflect a blur of light unless it were crinkled. The foil was held in place with rocks or with wood frames. Targets were made not less than 12 ft. across with 3 ft. the minimum width of each leg (See Fig. 1).

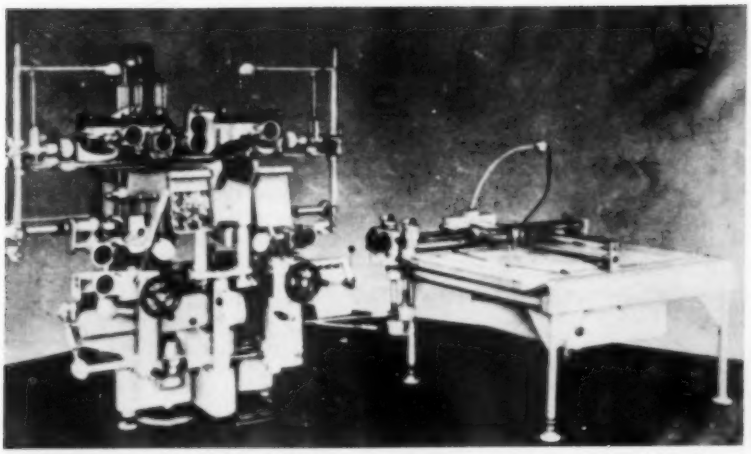
### Aerial Photography and Processing

The crew used by the surveyor during aerial photography included one photographer in addition to the pilot. A Zeiss RMK 15/23 camera, shown in Fig. 2, having a lens which produced nearly distortion-free pictures, was used. It is capable of shutter speeds up to 1/1,000 second and has a magazine capacity of 570 exposures on a 9 by 9-in. negative.

Pictures were made at a scale of 1 in. = 1,500 ft. with a 60% overlap resulting in a net gain along the route of about 5,400 ft. per picture. Flights for this survey were at approximately 9,000 ft. above the terrain.

Upon completion of the flights no further field work was required to write legal descriptions and make drawings. Processing the photography to accomplish this was done with a Zeiss C8 stereoplanigraph shown in Fig. 3. Prints of successive exposures were made on glass plates and mounted in pairs called "models" in the stereoplanigraph for a stereo view of the area photographed.

The stereoplanigraph has three dials which indicate "X" and "Y" ordinates on a horizontal plane together with "Z" ordinates for vertical values. After corrections were made in the machine for any deviation of the camera at the instant of exposure from a straight and level flight, it was ready to operate. When it is in proper adjustment, a pinpoint of light can be moved by the operator to any point on the



**PROCESSING OF PHOTOGRAPHS** for writing legal descriptions and making drawings was done with this Zeiss C8 stereoplanigraph. Fig. 3.

model with each dial constantly showing its ordinate for that point.

Work on each model was started by observing the machine coordinates when the light was placed on ground control monuments near opposite edges of the model. These machine values were then checked against the coordinates determined by the ground control party. After a satisfactory check was made, the operator placed the light over each survey point in that model and recorded the machine coordinates for each position.

The machine coordinates were then converted to Lambert coordinates by computations which are detailed but can be turned out quickly with an electronic computer. These coordinates were used to calculate the bearings and lengths between individual points along the pipeline route and to determine ties to points of record. With this information the surveyor was able to write legal descriptions from one end of the route to the other.

The approximate length of right-of-way on each landowner was determined by scaling from drawings made by photogrammetry. Exact lengths were not necessary since the footages were to be used in negotiated payments for right-of-ways and crop damage. Furthermore, the company did not care to participate in any disputes which may have existed over boundary locations.

In addition to the legal description the surveyor did all of the following work:

1. Made tracings showing the centerline of the route from which prints were made for right-of-way documents.

2. Made tracings of the route centerline and adjacent culture. These tracings will be base drawings for atlas sheets which will be completed by company draftsmen.

3. Made strip contour maps and profiles at selected locations.

4. Furnished an uncorrected aerial mosaic of the pipeline route on film suitable for blueprinting.

The aerial mosaic was made in sheets corresponding to the area shown on each atlas sheet. They will be used in atlas books so that a matching drawing and photograph will be on opposite sides. Photos were furnished contractors bidding the pipeline installation to assist them in locating the route, planning access to the job site, etc.

Also, in negotiating the right-of-ways the aerial photographs were found to be useful because landowners could readily recognize their land and the proposed route across it. They proved to be a popular item with the landowners, resulting in a number of requests for photographs. The cost of providing them was money well spent for good public relations.

To keep reproduction cost of the aerial photographs low, contact prints of the photography were mounted in sequence on a panel and then photographed. That picture was enlarged to a 1 in. = 600 ft. scale and a positive print made on the emulsion side of acetate safety film. The route of the pipeline was then inked on the opposite side of the film.

Although this process sacrifices some of the detail which could be achieved by a photographic process, the clarity of blueprints from the film is sufficient for all uses anticipated. The film is capable of erasure and re-inking so the company can maintain an up-to-date photograph of the pipeline route. These films will lend themselves to drawing notations of developments such as clearing or grading land adjacent to or over the pipeline.

Just prior to the start of construction, ground survey parties set intermediate stakes on line between the horizontal angle points. In brush country this crew worked with the lead tractors. In this way all brush clearing was done by heavy power equipment rather than by hand ahead of a preliminary survey party. Vantage points proved to be most valuable in this work. Setting stakes on long tangents which exceeded transit sight distances was expedited by using the Lambert coordinates of vantage points and calculating the offset to the centerline of the route.

**"At the outset the party chief was suspicious of the work done by photogrammetry and therefore made precise measurements of the first courses installed . . . The party chief is now inclined to suspect the field work if discrepancies are noted."**

### Aerial vs. Ground Survey

After the pipeline was installed, the stationing of intermediate facilities such as valves, contact points, and drips, was determined by a ground survey crew. At the outset the party chief was suspicious of the work done by photogrammetry and therefore made precise measurements of the first courses installed. By photogrammetry the first tangent was 1,054.01 ft. long. The chained length was 0.15 ft. longer. The second tangent of 706.90 ft. was chained with a result 0.07 ft. shorter.

One should not attach too much significance to these results because at the altitudes flown and the scales used this order of accuracy could not be expected. It is more likely a coincidence, but it does furnish solid evidence that good photogrammetric work was done. More typical was a 7-mile-long tangent which was chained at 0.8 ft. more than the photogrammetric length.

In 35 miles of pipeline installed across the floor of the San Joaquin Valley, the largest discrepancy found was 4.3 ft. but a difference in the opposite direction of 3.9 ft. was found in the next course. The party chief is now inclined to suspect the field work if discrepancies are noted. At present about one-half of the as-built survey is completed and there has been no need to adjust the photogrammetry results.

Eight miles of the as-built survey has been completed through hilly terrain. It was found that the probable difference in photogrammetric and chained lengths was 1.2 ft. A comparison of these lengths is shown in Table 1. The length of Course No. 8 which shows the greatest difference was made on a 45° slope where field measurements were most susceptible to error. It is interesting to note that generally the distances determined in the field are longer than those found by photogrammetry.

**TABLE 1**

| Course No. | Length determined, ft. In the field | By photogrammetry | Difference (ft.) |
|---|---|---|---|
| 1. | 3,234.00 | 3,234.95 | 0.95 |
| 2. | 1,654.53 | 1,654.28 | —0.25 |
| 3. | 1,838.55 | 1,838.67 | 0.12 |
| 4. | 5,375.08 | 5,375.13 | 0.05 |
| 5. | 4,482.85 | 4,482.80 | —0.05 |
| 6. | 4,093.45 | 4,095.33 | 1.88 |
| 7. | 3,298.82 | 3,295.61 | —3.21 |
| 8. | 876.72 | 872.38 | —4.34 |
| 9. | 676.63 | 677.41 | 0.78 |
| 10. | 1,343.92 | 1,342.47 | —1.45 |
| 11. | 4,116.35 | 4,114.39 | —1.96 |
| 12. | 2,362.66 | 2,363.02 | 0.36 |
| 13. | 1,325.94 | 1,324.39 | —1.55 |
| 14. | 2,928.97 | 2,932.15 | 3.18 |
| 15. | 1,473.88 | 1,473.88 | 0.00 |
| 16. | 1,264.50 | 1,264.71 | —0.09 |
| 17. | 5,632.15 | 5,632.02 | —0.13 |

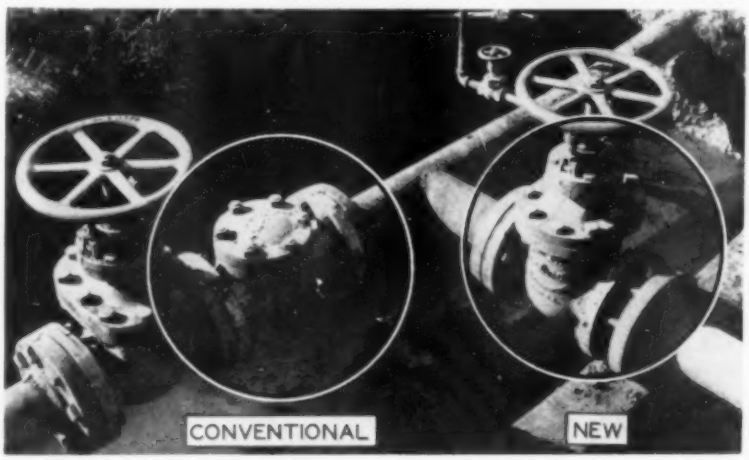
One of the major advantages of a photogrammetric survey is that the location of each point in the survey can be established independently of the adjacent points. This eliminates the accumulation of errors and the risk of compensating errors inherent in a traverse. Also, the independence of the points permitted the surveyor to work on any portion of the survey without completing all work to that point.

Another feature of a survey of this type is that it can be done with a minimum amount of activity in the field. This can be a decided advantage to those who will follow negotiating right-of-ways.

Relating a survey to the state coordinate system is highly desirable. It eliminates the problems associated with tying the survey to a series of unrelated or inaccurately related surveys of record. Having coordinate values on all points makes the problem of resetting lost points relatively simple. This is true not only of angle points in the pipeline route but also monuments on points of record used in the legal description.

This experience with photogrammetry indicates that it is an entirely satisfactory method for surveying a pipeline route. Without exception, the points checked in the as-built survey demonstrate that the accuracy was within the limits required. Work was 95% completed 16 weeks after the survey was started. This was estimated to be 40% of the time which would have been needed by ground crews. The cost was estimated at 55% of the cost for a conventional ground survey.

In view of these results, Pacific Lighting Gas Supply Co. would not hesitate to make another survey by photogrammetry. Although photogrammetry was well suited to this survey, it should not be assumed that it is the answer to all survey problems. However, where the survey length is sufficient to justify the cost of the aerial photography or the terrain is such that conventional crews would have difficulty, or where unusual speed is required, this method of survey merits serious consideration.




Difference in weight explains why . . . Fig. 1

# New check is lightweight

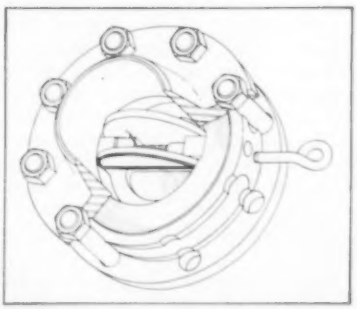
A CHECK VALVE just introduced weighs only a fraction as much as conventional checks. In most pressure ranges and sizes, the new check weighs only about 10% as much as older types. It is made by Wheeler Valve Corp., of Houston, and it comes in sizes from 3-in. to 36-in. Pressure ratings go as high as flanges are available.

Because of its lighter weight, the valve is cheaper, easier to install and maintain, and less expensive to ship. It can be made of corrosion-resistant materials for only a slight increase in cost.

Fig. 1 shows the valve installed in a 4-in. line near a conventional check.

As Fig. 2 shows, the new check uses two side-by-side clappers. These clappers are half-circle. The two hinge in the middle of the valve and open back in the manner of two side-by-side doors on which the hinges are in the middle.

The valve uses a molded seal which has a contour much like an O-ring. Or, of course, metal-to-metal seals can be used. A middle web in the valve furnishes the sealing surface for the hinged side of the clappers. This middle web is part of the secret of the light weight of the valve. Since it supports the clappers in the middle, they need not be nearly so thick as if a single large clapper were used.



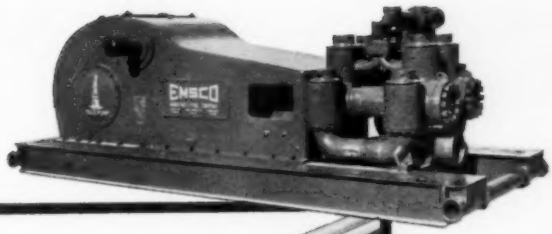
**NEW CHECK** uses two side-by-side clappers, half-circle. The two hinge in the middle and open back like double doors. Fig. 2.

The middle-hinged clappers make it possible for the valve to be quite short compared to conventional checks. Because of this shortness, the walls of the check can be made thicker with very little addition to total weight.

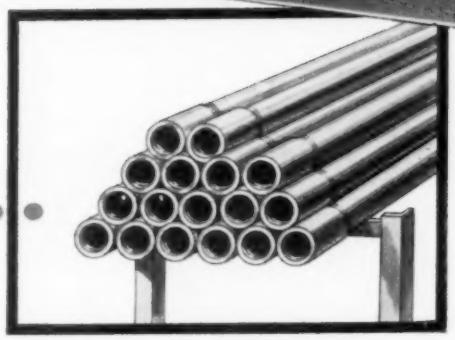
Of course, the valve can't be used in lines which must be "pigged." However, the pressure loss through the valve is quite small.

Major companies in the Gulf Coast have tried the new check and report satisfaction with its performance.

# Pumps...




# Pipe...



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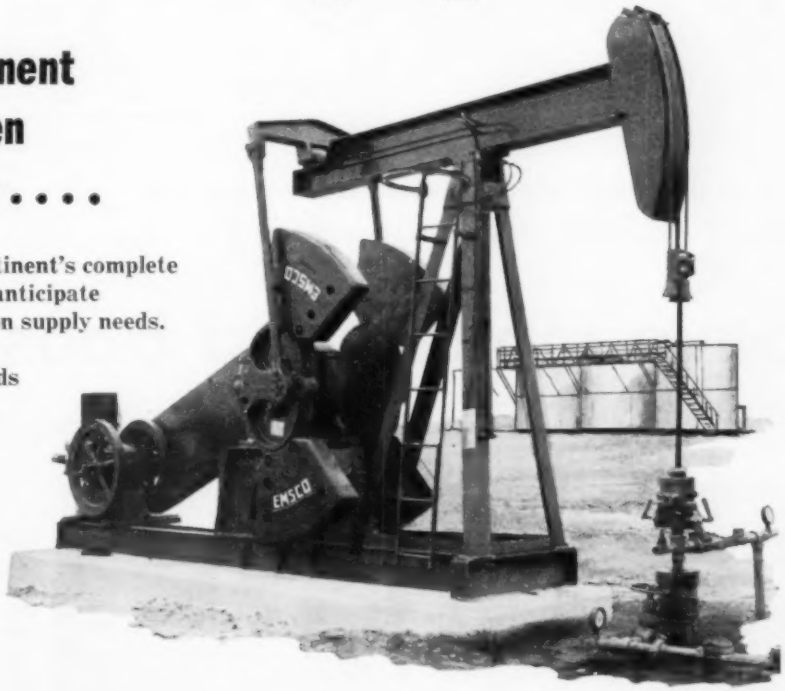


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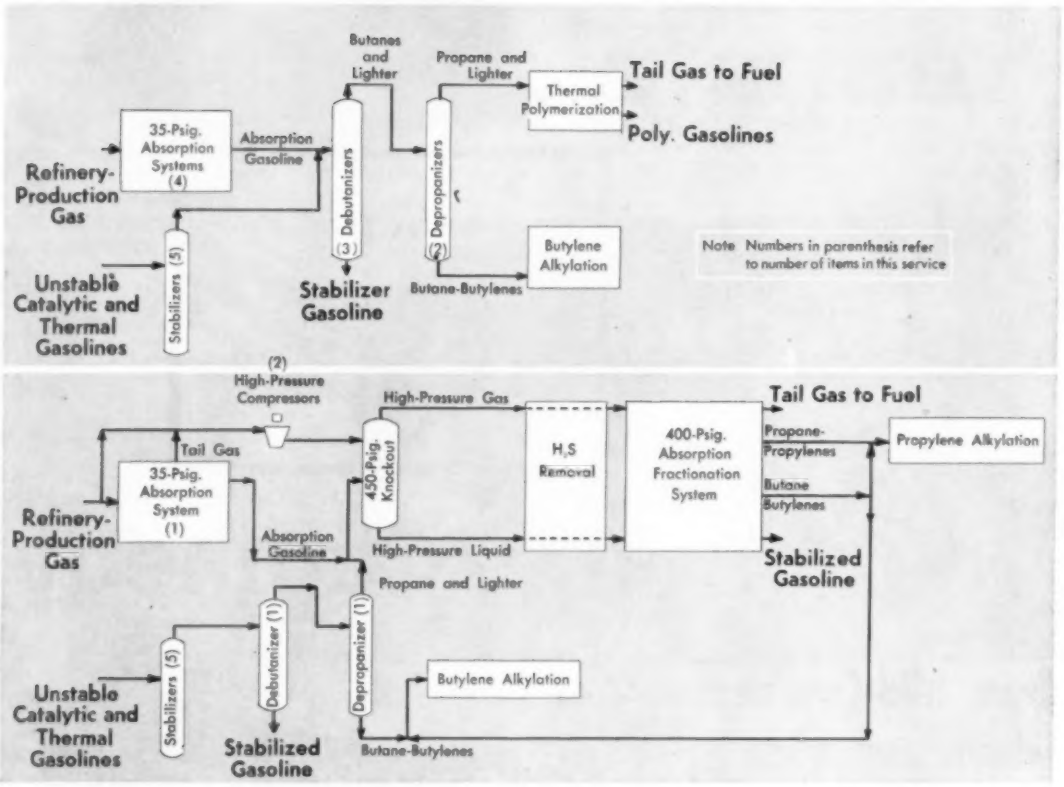



The 35-psig. absorption recovery system at top and the 400-psig. system at bottom show the way to

# Save money and boost octane

## with propylene alkylation

By L. J. McGOVERN

INCREASED octane requirements for motor fuels coupled with the availability of propylenes in the refinery's gas production made it attractive for Magnolia Petroleum Co. at Beaumont, Tex., to install a propylene alkylation unit for the production of motor gasoline.

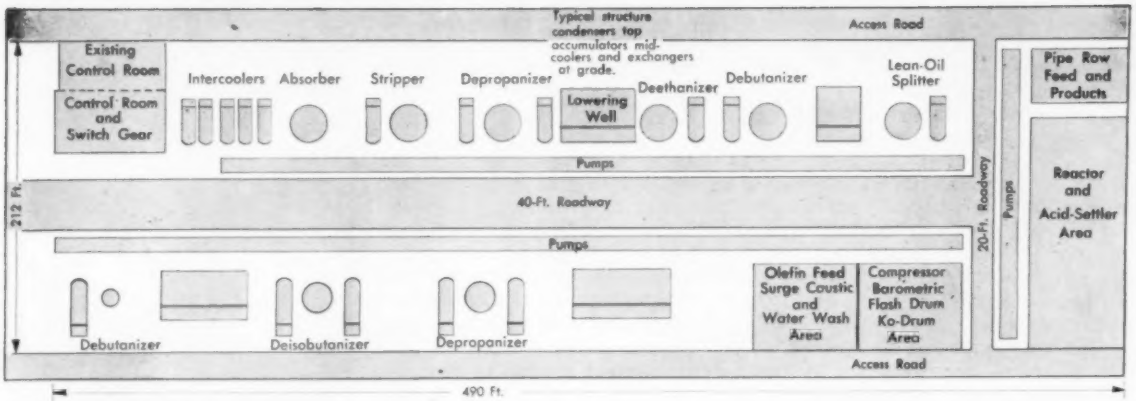
The nominal design capacity of the unit is 8,000 bbl. per stream day total alkylate produced from a feed having an olefin composition of 85% propylene and 15% butylene. The refinery's pool octane will be increased 0.6 F-1 +3 cc. TEL.

The criteria of design for the unit were to control acid consumption in the range of 1.0 to 1.1 lb. per gal. of total debutanized alkylate and to produce a total alkylate having an ASTM distillation final boiling point under 400° F. In addition to the alkylate for motor gasoline, 3,300 bbl. per day of propane and 2,200 bbl. per day n-butane meeting 95.0% purity and NGAA specifications will be produced.

**Feed prep . . .** A completely new olefin feed-preparation system was included in the scope of the project to recover 99.9% butylenes and 90.0% propylenes from 24 M.M.s.c.f.d. refinery production gas and 14,500 bbl. per day of refinery absorption gasoline. The recovery system operates with a 400-psig. fractionating-absorption system (2 towers) and product fractionation to produce a 7,000-bbl. per day propylene rich stream, a 7,000-bbl. per day butylene rich stream, a debutanized light lean-oil stream 280° F. e.p. and a 280°-385° F. boiling-range heavy lean-oil stream.

The project was engineered jointly by the Magnolia staff, Stratford Engineering Corp., Foster Wheeler Corp., and C. F. Braun & Co. These are the first units constructed at Magnolia using the rigorous tray-to-tray multicomponent distillation calculation on a stored-program computer for tower design.[1] Construction was completed by the Magnolia staff, Foster Wheeler, and C. F. Braun. The unit came on stream June 7, 1958.

**Octane picture . . .** The octane increase in the gasolines marketed in the United States has averaged approximately 1 octane number per year




**UNIT PLOT PLAN** for Magnolia's propylene alkylation unit u es a U-shaped layout with absorption-feed fractionation system in one leg, caustic scrubbing and alkylation unit frac ionating sections in the other leg, and the alkylation reactor system at the end. Fig. 2.

for the last 30 years.[2] Forward planning in 1954 and 1955 indicated that at the 1958 octane levels, the investment required for the recovery of incremental olefins and the production of propylene alkylate for motor gasoline was warranted compared to other methods available.

Although the complexities of modern refineries make it impossible to calculate one set of octane improvement costs that will adequately cover all refineries, the analysis presented by W. E. Askey et al.,[3] for a Gulf Coast refinery adequately describes Magnolia's position. Justification for the unit was approximately 2 years ahead of the timetable by Askey; however, this was a peculiarity of the Magnolia refinery and its existing and budgeted facilities and octane requirements.

**Recovering olefins . . .** Prior to the construction of the propylene alkylation unit and its gas-handling and feed-preparation systems, Magnolia operated 35-psig. absorption recovery units. In 1954 a major expansion of catalytic cracking facilities,[4] scheduled for completion in the early part of 1957, required either expansion of the existing facilities or construction of new facilities to handle an incremental 550-M.s.c.f.d. refinery gas. This need for capacity coupled with the increasing octane requirement make it attractive to construct new equipment and r e c o v e r the incremental olefins.

The processing schemes before and after expansion are shown in Fig. 1. The existing 35-psig. absorption units recover 95% of the butanes and 50% of the propanes in the gas feed to these systems. The new system replaces 35-psig. absorption with 450-psig. compression, incorporates treating for both gas and liquid streams from compression for hydrogen sulfide removal, and raises the absorption-system pressure level from 35 psig. to 400 psig. Studies indicated that 400-psig. absorption was superior to a 200-psig. absorption on the basis of a 2.9:1 reduction in lean-oil circulation for a fixed recovery of 85% of gas-phase propylene fed to the absorber.

Between 400 and 750-psig. operating pressure, refrigeration became competitive with pressure for operation, and above 750 psig., refrigeration appeared to be attractive. Magnolia's existing towers in its propane thermal-polymerization unit[5] operate in the range of 350-400 psig., which also made it attractive for transition operation to use the 400-psig. pressure level of compression and absorption.

The feed-preparation system for the propylene alkylation unit is unique for the refinery in that the distance between the feed compressors and the absorption distillation section, Fig. 1, is 1½ miles. At the halfway point the high-pressure gas and liquid knockout streams are treated for hydrogen sulfide removal. There are no surge drums in the system.

## About the author . . .

The a u t h o r is supervisory process engineer at t h e Beaumont, Tex., refinery of Magnolia Petroleum Co. He obtained h i s B.S. degree in chemical engineering at Kansas S t a t e College in 1948. He started with Magnolia in 1948 in the technical supervision of refinery processing of lubricating oil, waxes, and catalytic cracking. Since 1954, he has been involved in supervisory process design of and control of liquefied petroleum gas fractionating facilities, light-hydrocarbon recovery and alkylation facilities.

### Layout and Unit Control

The unit plot plan, shown in Figs. 2 and 3, is a U-shaped layout with the absorption-feed fractionation system comprising one leg, the alkylation reactor system the end, and the caustic scrubbing and alkylation unit fractionating sections the second leg. In line, compact construction was used with adequate access roadways provided for mechanized equipment. The control room is located at the one end of the equipment "U" and is consolidated (Fig. 2) with the existing control room of the recently constructed LPG fractionating facilities.[6]

The control instruments are mounted in a miniature graphic panel, approximately 60 ft. in l e n g t h, using a U-shaped layout for maximum operator observation. Highlighting the control panel are four gas-phase chromatographic analyzers, used to monitor the process streams.[7] Absorber tail gas is analyzed for propylene content since this is the key recovery component. The propane-propylene stream is analyzed for ethane content since the rejection of ethane in this system is critical to the alkylation unit compressor performance and the propane produced from the alkylation unit must meet 95% purity and NGAA specifications.

The propane produced on the depropanizer in the alkylation unit is monitored for isobutane content. The normal butane produced from the alkylation unit is monitored for both isobutane and isopentane. This stream m u s t also meet 95% purity and NGAA specifications.

In addition to the above streams, sample-loop manifolding is provided

for spot analysis of the butane-butylene stream for isopentane content, the total olefin feed to the alkylation unit for a complete analysis, and the isobutane recycle stream in the alkylation unit for propane and normal butane.

It is anticipated that these alternate streams will be analyzed once each 8-hour shift to provide data for unit material balances and additional "on the spot" operational corrections. To facilitate operation of the equipment, the refrigeration-compressor and reactor-system controls are located on a second control board adjacent to the compressor. It was felt that these two sections warranted continual observation since they are the heart of the alkylation reaction.

### Feed-Prep Process Design

The process flow of the unit is shown in Fig. 4. For ease of construction the fractionating-absorption system was constructed as two towers. The sponge section of the absorber has 15 trays with one intercooler; the main absorption section 22 trays with 4 intercoolers. The intercoolers are spaced and designed to provide a maximum absorber temperature of 120° F. The lean-oil rates to the absorber are 5,200 bbl. per day heavy lean oil (280°-395° F. ASTM boiling-point range) and 9,000 bbl. per day light lean oil, 280° F. e.p., predominantly pentanes.

High-pressure gas feed enters the absorber and high-pressure liquid feed together with the fat oil, absorber bottoms, is charged to the stripper. A partial deethanization is obtained on the 20-tray stripper with the final deethanization being completed on the 20-tray deethanizer tower, feeding the depropanizer overhead. The overhead products from both the stripper and the deethanizer are recycled to the absorber. It was found in this unit that two-stage deethanization was advantageous by 30% on investment and 40% on operating costs versus obtaining deethanization on a single stripper tower.

The ethane content of the streams are 0.5% on the stripper bottoms, equivalent to 2.0% based on propane-propylene content, and 0.3% on the propane-propylene stream from the deethanizer. The overhead recycle product from the deethanizer is designed for a 50% propane-propylene content to afford temperatures and pressures compatible with a nonrefrigerated fractionating system. The remaining portion of the distillation system is in the conventional order, i.e., depropanizer, 40 trays; debutanizer, 34 trays; and lean-oil splitter, 20 trays.

The depropanizer is designed to produce a 7,000-bbl. per day propane-propylene stream containing 1.5% isobutane. The debutanizer is designed to produce a 7,000-bbl. per day butane-butylene stream containing 2.0% isopentane. The lean-oil splitter is designed for a feed of 5,500 bbl. per day outside light gasoline, 2,000 bbl. per day makeup heavy lean oil, and the circulating lean oils.

The tower design of 20 trays and 0.6:1 ratio of reflux to overhead product is based on experience and will produce between a 10° F. gap and a no gap-no overlap between the e.p. and i.b.p. of the ASTM distillations on the light and heavy lean oils respectively. A heavy lean-oil design ASTM distillation of 280°-395° F. will reduce the loss of $C_6+$ in the absorber tail gas to 25 bbl. per day. The absorber, stripper, debutanizer, and lean-oil splitter are equipped with Uniflux trays.

### Process Design—Alkylation

The olefin feed to the alkylation section is composed of the entire propane-propylene stream and a portion of the butane-butylene stream produced in the feed-preparation system. The combined design olefin feed composition is shown in Table 1. The remaining portion of the butane-butylene stream is sent to storage for processing on the existing butylene alkylation unit.[8]

The alkylation unit is of conventional process design and employs effluent refrigeration with five, Model 50, Stratco contactors. Adequate descriptions of the system can be found in the literature.[9,10] The process design of the system was developed to meet the following factors:

1. Isobutane concentration in the reactor effluent—65.0% by volume.
2. External isobutane to olefin ratio in reactors—9.28:1.
3. Reactor temperature—53° F.
4. Isobutane recycle purity—85.0% by volume.
5. Depropanizer propane-removal efficiency based on propane in the tower feed—80.0% by volume.
6. Product purities:

| Product and impurity— | Vol. (%) | Other |
|---|---|---|
| Propane: | | |
| $iC_4$ | 3.0 | Meeting NGAA specifications |
| n-Butane: | | |
| $iC_4$ | 4.0 | Meeting NGAA specifications |
| $iC_5$ | 0.5 | Meeting NGAA specifications |
| Alkylate product: | | |
| $nC_4$ | 1.0 | |

Although there are no effluent refrigeration units in operation with a propylene feed of 85%, it was estimated that the above operating conditions would give the performance shown in Table 2. With an estimated ASTM end point on the total alkylate well under 400° F., no rerun facilities were provided to separate the total alkylate into light and heavy fractions.

**MAGNOLIA'S** propylene-alkylation unit has its control room consolidated with the control room of the newly built LBP fractionating facilities. Fig. 3.

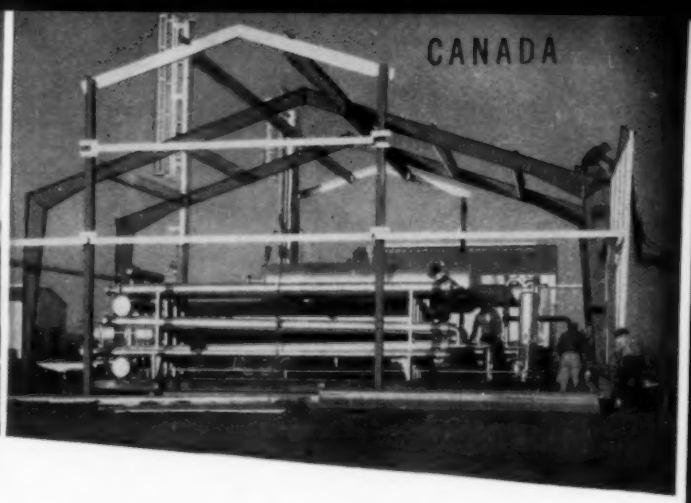
**TABLE 1—MAGNOLIA'S PROPYLENE ALKYLATION UNIT OLEFIN-FEED COMPOSITION**

| Component | Liquid volume (%) |
|---|---|
| $C_2$ | 0.4 |
| $C_3=$ | 38.2 |
| $C_3$ | 31.0 |
| $iC_4$ | 13.7 |
| $C_4=$ | 6.8 |
| $nC_4$ | 9.2 |
| $iC_5$ | 0.7 |
| | 100.0 |

**TABLE 2—PREDICTED PERFORMANCE OF MAGNOLIA'S PROPYLENE ALKYLATION UNIT**

| | |
|---|---|
| Total alkylate: | |
| Acid consumption, lb. per gal.* | 1.0-1.1 |
| F-1 clear | 91.5 |
| F-1 +3 cc. TEL | 103.0 |
| R.v.p. | 4.5 |
| ASTM distillation, °F.: | |
| I.b.p. | 130 |
| 10 | 160 |
| 30 | 198 |
| 50 | 214 |
| 70 | 228 |
| 90 | 297 |
| End point | 385 |
| Light alkylate: | |
| Yield of 338° F. e.p., per cent of total debutanized alkylate | 97.0 |
| F-2 clear | 90.0 |
| F-4 4.6 cc. TEL | 141.0 |

*Total debutanized alkylate. (Fresh acid 98%. Spent acid 89.0-90.0%.)



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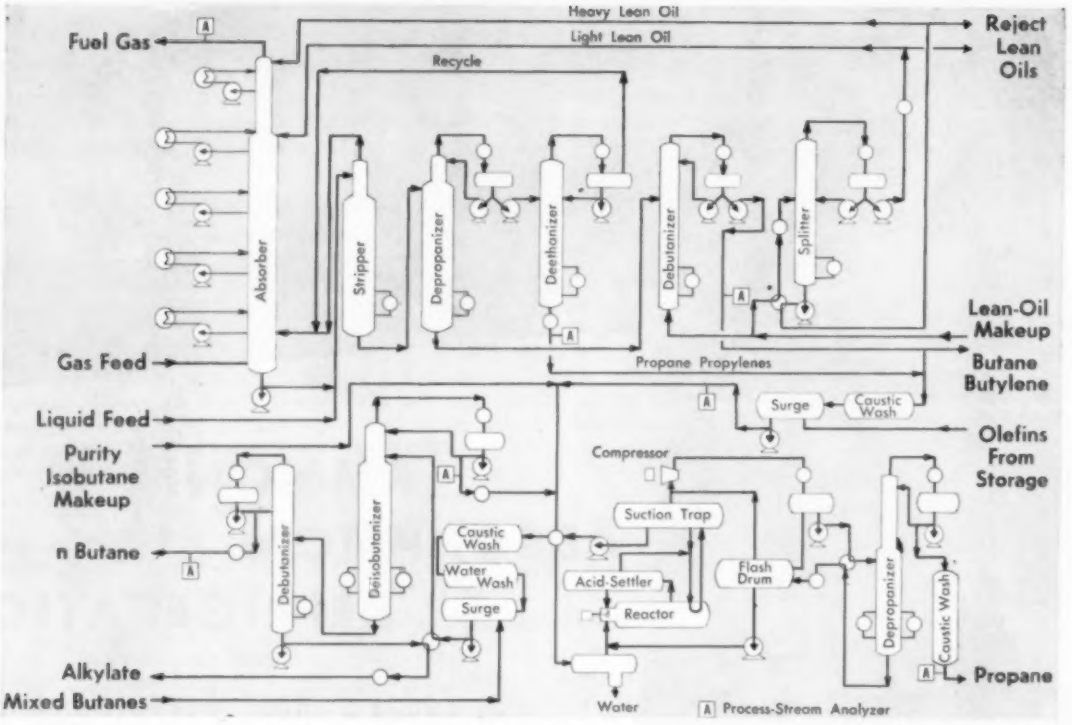


**PROCESS** flow diagram for the new propylene-alkylation unit shows the fractionating-absorption system, which was constructed as two towers for ease of construction. Fig. 4.

The deisobutanizer and debutanizer are equipped with Uniflux trays.

**Alternate feed-prep operations . . .** To facilitate maintenance of the equipment provisions have been made to shut down sections of the olefin feed-preparation system for emergency repairs or turnaround. The absorber may be brought off stream, high-pressure gas feed will be diverted directly to fuel gas, and high-pressure liquid feed will be introduced into the stripper at the sixteenth tray from the bottom. Heavy lean oil can be circulated to the top tray of the stripper and a fractionating-absorption operation carried out in the single tower.

The deethanizer may be shut down and the desired level of ethane rejection obtained on the stripper at the lower recovery level. The depropanizer may be shut down and the combined propylene-butylene streams taken as an overhead product on the debutanizer. This stream will subsequently be split into propane-propylene and butane-butylene streams on existing refinery equipment. The lean- arc between alternating runs. **Write** oil splitter may be shut down, in which case debutanizer bottoms product will be used as light lean oil to the absorber and sufficient heavy lean-oil makeup can be brought into the unit to satisfy the requirements of the absorber.

With only the depropanizer in operation, a deethanization (partial depropanization) operation may be accomplished on the high-pressure liquid feed at a tower pressure of 375 psig. The deethanized high-pressure liquid will then be fractionated on existing refinery equipment. The estimated recovery efficiencies for propylene, compared to normal operation, varies from 44.0% with only the depropanizer in service to 90.0% with only the deethanizer out of service. In all cases where propanes and butanes must be fractionated on existing refinery equipment, other refinery LPG operations will be curtailed.

It is anticipated that this will be accomplished at minimum loss in processing efficiency by use of the Magnolia's Hull underground storage,[11] near Daisetta, Tex., to store products during surge periods. During periods when either the propylene or butylene alkylation units are down for turnaround, the olefin feed streams, over and above the available capacity, will also be transferred to Hull for temporary storage.

**Alkylation maintenance . . .** To facilitate on stream maintenance in the alkylation unit, twin reboilers are provided on the depropanizer and deisobutanizer towers and are valved so that one bundle may be removed for cleaning and repair. All condenser services requiring two or more shells are valved so that individual shells or banks may be removed. One or more of the reactor systems may be shut down if required. All pumps required for continuous service, during normal operation, have 100% spares except the five duplicate effluent pumps from the reactor systems which have two spares.

A single centrifugal compressor, 5,900 b.hp., 120% of design capacity, is provided. Performance of similar compressors in equivalent services indicated that the additional cost of a spare compressor, or twin compressors of 60 to 75% of design capacity, was not warranted.

**Utilities . . .** Utility service to the unit includes 400, 150, and 25-psig. steam; drinking, fire, raw city, and clarified water; instrument and yard utility air; natural gas; and 2,300 - volt power. Process drivers and reboilers were selected to provide a balanced load on the 150-psig. and 25-psig. extraction turbines of the central generating facilities. With a total 400-psig. steam requirement of 290,000 lb. per hour for power and steam, the normal operating-condition load was balanced to within 8% between steam and power requirements.

The design cooling-water circulation to the units is 32,000 g.p.m., 87.5°-113.5° F., 48% of which is

reused before returning to the cooling tower. An economic study revealed that 87.5° F. was an optimum design inlet temperature for this system. Wet and dry bulb design is 80° and 90° F.

Caustic and acid-storage facilities have been provided adjacent to the unit battery limits and are operated by unit personnel. Two caustic-storage tanks, 500-bbl. capacity each, receive 20° Be. fresh caustic from existing tank-car-unloading facilities at the butylene alkylation unit. Spent caustic is pumped into the hydrocarbon relief line.

The spent caustic and heavy hydrocarbons are retained in a knockout drum ahead of the flare and pumped into the refinery slop-oil emulsion-breaking system. This method of handling has proven very satisfactory on the butylene alkylation unit for many years since it is convenient and protects the relief line from corrosion attack by dilute acid.

Pipeline deliveries of approximately 270 tons per day of fresh and spent acid are received from, and delivered to, the Olin Mathieson Chemical Corp.'s Beaumont plant, located ½ mile from the refinery. This plant also receives, by pipeline, the hydrogen sulfide recovered from the hydrocarbon feed streams at the treating unit.

Fresh acid is received into two 1,500-bbl. tanks. Spent acid from both the new propylene and the existing butylene units is run down to a 1,500-bbl. tank. Fresh and spent acid pumpings will normally be made during the daylight shift. Facilities are provided to spend the entire acid requirement through the propylene and butylene units in series, with an intermediate acid strength of 93.5%. Prior to this expansion, fresh and spent acid was handled by tank-car movement.

Clarified water makeup for the cooling tower is pumped to the unit from facilities installed adjacent to the central power-generating facilities.

### Maintenance Design

In the construction and layout of the unit considerable detail was given to planning for maintenance. The 40-ft. and 20-ft. roadways, shown in Fig. 2, provide ready access for mobile equipment to the pump rows along the inside of each "U" leg and across the end closure. The overhead condenser structures provide lowering wells and pulling beams for the exchanger bundles both at grade and at the condenser levels.

The pulling beams at grade are easily removed for access to the equipment. The upper pulling beams for the condensers are equipped with walkways for ease of operation. The lowering hoists may also be used to assist in rigging valves and piping from all levels in the structure. All exchangers pull, and can be removed, toward the outside of the plot plan onto access roads. Those exchangers at grade, not in the lowering well areas, are equipped with recess pulling rings, set in concrete pulling blocks and covered with protective plates. These pulling blocks are anchored against the exchanger foundation for maximum pulling capacity at minimum installation cost.

The anchor or brace system is independent of the surface concrete to allow for temperature expansion. Davits with a minimum capacity of 1,000-lb. load are installed over every relief valve. These davits also serve in rigging piping and valves. All pumps are equipped with monorails for handling pump cases and motors for either work in place or removal from the unit to the shops. Manholes at the top and bottom of each tower and every eighth tray are provided for ease of internal maintenance. All manholes are in line and tray sections, valves, and piping may be lowered with the tower top davits to an open receiving area adjacent to the tower base and convenient to the outside access roads.

**Utility stations . . .** Outlets for 125-psig. steam, 80-psig. air, water, and power are provided at convenient grade locations and on structures and towers at points so that all equipment can be adequately serviced by 50-ft. utility hoses and power extensions. Operating personnel can totally prepare the unit for mechanical work with a pumpout system (for liquids), steamout, and water-fill facilities on all towers and vessels. All low spots in lines are equipped with bleeders for adequately clearing the unit of hydrocarbon.

All operating valves for normal operation, startup, or shutdown procedures, are accessible from grade or permanent walkways. For startup operations four natural-gas connections are provided for displacing water from the towers and vessels and for pressuring the system. All piping and exchanger systems which have a holding capacity of 100 gal. or more are permanently connected into the liquid pumpout system. All accumulator vessels, and towers with 20 trays or less (approximately 55 ft. high), are tied into a closed relief system to prevent ground settling of hydrocarbons relieved from the system.

Acidic hydrocarbon streams are caustic scrubbed before entering the main relief system to the flare. Relief valves from the towers above 55-ft. height are vented to the atmosphere. All towers have multiple relief valves sized so that removal of any one valve for inspection or repair will leave the tower with a 100% relief system.

### Safety—Blowdown System

For protection of the personnel and equipment in the event of fire, explosion, or other disaster in the unit, a hydraulically operated liquid dropout system is provided on all towers and vessels. The control center of this system, readily seen in Fig. 3, is located behind an 8-ft.-high L-shaped fire wall adjacent to the control room. The hydraulically operated valves dump the tower liquids into the previously mentioned pumpout system. If sufficient pressure is available to force the liquid through the closed relief system to the flare, the pumpout pump is bypassed with hydraulically operated valves; otherwise, the pumpout pump is hydraulically placed in service.

Hydraulic fluid pressure is maintained in the system by an atmosphere-exhaust steam-turbine-driven pump. In the event of failure of the operating pump, a spare will automatically come into service on pressure control. In the event of failure of both hydraulic fluid pumps, a nitrogen blanket system will maintain sufficient pressure in a high-pressure hydraulic oil reservoir, to operate all of the hydraulically operated valves in the system. Should it be necessary to isolate the unit, facilities are provided to manually block all process and utility lines at the battery limits with readily accessible valves.

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# "Grass roots" projects highlight refinery picture

**SHADED PORTION** of map shows areas covered in this report.

• **Atlantic Refining Co.** will complete a 20,000-bbl. visbreaker and increase capacity of vacuum unit charging topped crude 40,000 bbl. at Philadelphia in 1959. **Badger Manufacturing Co.** has contract.

• **BP Canada, Ltd.,** will complete a $30,000,000, 25,000-bbl. plant at Ville d'Anjou, Que., by mid-1960. It will include a 9,000-bbl. cat cracker, a 6,000-bbl. cat reformer, a hydrodesulfurization unit, and a polymerization unit. **Lummus Co. of Canada, Ltd.,** prime contractor, has the project under way.

• **California Oil Co.** will complete, December 1958, a 10,000-bbl. UOP Platformer-Unifiner at Perth Amboy, N. J. Contractor is **H. K. Ferguson.** Also to be completed in December 1958, is a 10,000-bbl. increase in crude capacity and a 5,700-bbl. increase in capacity of vacuum unit charging topped crude.

• **Chemoil Corp.** is considering building a plant between New Orleans and Baton Rouge, La.

• **Commerce Oil Refining Corp.** plans to complete July 1, 1959, a $48,000,000, 43,000-bbl. plant at Jamestown, R. I. Plans include a 21,500-bbl. vacuum unit to charge topped crude, a 40,900-bbl. fluid cat cracker (50% recycle), a 10,000-bbl. Platformer, a 10,000-bbl. Unifiner, a 2,600-bbl. alkylation unit, an 800-bbl. catalytic polymerization unit, sulfur capacity of 86 tons, and coke capacity of 566 tons. **Lummus Co.** handled some of the original process planning. **Fluor Corp., Ltd.,** has construction contract.

• **Delta Refining Co.** will increase crude capacity from 12,000 to 18,000 bbl. at Memphis before the end of 1958.

• **Elk Refining Co.** will increase Platforming 500 bbl. at Falling Rock, W. Va., by January 1, 1959.

• **Esso Standard Oil Co.** is adding a 15,000-bbl. Hydrofiner at Bayway, N. J. **Foster Wheeler Corp.** has contract.

• **Gulf Oil Corp.** will complete a 10,000-bbl. pentane isomerization unit (Penex) at Port Arthur, Tex., late 1958. **Procon, Inc.,** has contract. Early in 1959, Platforming capacity will be increased 12,000 bbl.

• **Hess Transport & Trading, Inc.,** is nearing completion of a 40,000-bbl. plant at Port Reading, N. J. **Lummus Co.** has contract.

• **Irving Refining, Ltd.** (Irving Oil Co. and Standard Oil Co. of B. C.), will complete in 1960, a 38,000-bbl. plant at St. Johns, N. B. It will include a two-stage crude unit, a 13,000-bbl. fluid cat cracker (30% recycle), a 7,150-bbl. cat reformer, a 5,000-bbl. hydrodesulfurization unit, and a 2,500-bbl. hydrogen-treating unit. Cost will be $45,000,000 to $50,000,000. **Bechtel Corp.** is contractor.

• **North American Petroleum Corp.** has bought site for a proposed plant at Corpus Christi, Tex.

• **Pontiac Refining Corp.** has let contract to **Fluor Corp., Ltd.,** for redesign and modification of a crude unit, and design and construction of a 5,000-bbl. Unifiner at Corpus Christi, Tex. Cost is $1,500,000.

• **R. I. Oil & Refining Co., Inc.,** plans a plant at Tiverton, R. I.

• **Seminole Oil Co.** has indefinite, long-range plans for a $16,000,000, 15,000-bbl. plant at Fort Pierce, Fla., to be operated by Frontier Refining Co.

• **Socony Mobil Oil Co., Inc.,** will complete early 1959, a 19,000-bbl. delayed coker at Paulsboro, N. J. **Lummus Co.** is contractor.

• **Southland Co.** has bought site at Black Point, Fla., for a proposed $8,000,000, 15,000-bbl. plant.

• **Southeastern Refineries, Inc.,** plans a 5,000-bbl. plant at Savannah, Ga., to make asphalt from heavy imported crude. Cost is estimated at $1,900,000.

• **Sun Oil Co.** plans a 50,000-bbl. expansion of crude-cracking and distillation facilities at Marcus Hook, Pa. **Catalytic Construction Co.** completed engineering of the project first half 1958.

• **Sunshine State Refineries, Ltd.,** plans to complete late 1959 or early 1960, a 25,000-bbl. plant at Plant City, Fla. It will include a 5,000-bbl. Platformer, a 10,000-bbl. Unifiner, a Thermofor, and an alkylation unit. **Kaiser Engineers** has contract.

# Value of low-gravity crudes

Questions on TECHNOLOGY

BY W. L. NELSON
Technical Editor and
Petroleum Consultant

**Can you suggest publications on the marketing, economics, and utilization of low-gravity and asphalt-base crudes? W.E.S.**

Scarcely anything has been published that pertains exactly to the question, although much technical information on the general relationship of gravity to yields or to properties has appeared on this page. In fact, little useful or practical information about the economics or marketing of crude oils (light or heavy) has been published. Perhaps the best book on the general subject is "The Growth of Integrated Oil Companies," by McLean and Haigh, published by the Harvard Business School 1954, but it treats of low-gravity oils only incidentally and at only a few places.

Basically the low-gravity oils are often asphaltic (naphthenic) and they frequently contain a large amount of sulfur. Nevertheless the most typical naphthenic or asphalt-base oils such as those of the Gulf Coast and Far East contain very small amounts of sulfur. Amount and quality of the products underlie the marketability of the products and hence tabulations of the properties of products as a function of "base" or characterization factor such as Table 4-1, page 82, of the fourth edition of Petroleum Refinery Engineering (McGraw-Hill Book Co., Inc., N. Y., 1958) should be consulted. This indicates the superior quality of the gasolines and diesel fuels contained in most naphthenic-base crude oils. Likewise yields can be approximated from the distillation curves of Fig. 4-3 (and other figures) in Petroleum Refinery Engineering.

### Proper Differential

Although a reduction in crude oil price of 2 cents per degree API has been widely employed ("What's the Value of a Degree API," The Oil and Gas Journal, May 23, 1955, p. 137), the true or proper "differential" is a function of the prices of gasoline (low-boiling components) and residual fuel oil, and the "differential" should be larger than 2 cents per degree API. This has been discussed several times on this page, "Computing Crude Oil Differential," August 15, 1955, p. 183; "What's the Value of a Degree API," May 23, 1955, p. 137; and "How to Estimate Value of Crude Oil," November 8, 1954, p. 191. The differential can be approximated with fair accuracy from:

$$\text{Differential} = \frac{2\,G + D - 3\,B - 3\,\text{cost}}{3 \times 50}$$

in which G, D, and B are respectively the prices (dollars per barrel) f.o.b. refinery of regular gasoline, average distillate fuel, and No. 6 fuel oil, and "cost" refers to the cost of the refinery operation also in dollars per barrel. Differentials as high as 9 or even 13 cents per degree have been used in California (1949), and values as high as 6 in Wyoming (1949-1954). Thus regions that produce low-gravity oils use a larger differential in price per degree API. It is obvious that low-gravity crude oils contain large amounts of residual fuel oil, and thus attempts have been made ("What Are the Values of Low-Gravity Crude Oils?" The Oil and Gas Journal, March 14, 1955, p. 140) to relate "value" of oil to the price of No. 6 fuel oil.

### Market Index

If the price of fuel oil is low relative to that of gasoline, the value of the crude oil will be lower than that of Bunker C fuel (1934, 1946, and 1948), whereas if the price of fuel oil is high, the crude oil will be worth more than Bunker C fuel (by large amounts) as during 1931, 1949, and during most years. Thus the market structure may be related to gasoline and fuel oil prices by means of a so-called market index which is discussed in the article.

Low-gravity crude oils are more viscous. Only at the extremely low gravities are special terminal handling facilities needed but, of course, viscosity is always an important factor in pipeline operation. Viscosities of crude oils as a function of gravity was discussed on this page on the date of November 8, 1954, p. 192 (Viscosity of Various Crude Oils), and various methods of handling such oils are discussed in three articles ("How to Handle Viscous Crude Oils," November 15, 1954, p. 269; "Pumping of Cold Viscous Crudes . . .," June 6, 1955, p. 143; and references, August 8, 1955, p. 129).

The sulfur content of low-gravity oils is often high but they usually are not sour. Although West Texas oils of even 38° API are usually sour (though they may be classified under sweet schedules), the viscous oils of California, Mexico, and Venezuela are not sour. The penalties for high-sulfur and sourness have been repeatedly discussed on this page and some of the latest discussions are "Separate Penalties for High Sulfur and Sourness," August 1, 1955, p. 117, and "Cost of Refining High-Sulfur Crudes," December 31, 1956, p. 207 (also see Table 9-1, p. 277, of the fourth edition of Petroleum Refinery Engineering.

### Naphthenic Oils Prized

Truly naphthenic oils are often prized because of the low pour points of the distillate fractions, and in the extreme, the low-cold-test lubricants contained in such crude oils may be valuable ("Low Cold Test Crude Oils Are Rare," The Oil and Gas Journal, June 20, 1955, p. 118).

Finally, the approximate cost of petroleum refineries as influenced by gravity was discussed on the April 21, 1958, p. 175, issue of this page, and the cost of operation as a function of gravity in "Effect of Gravity on Refinery Operating Costs," November 26, 1956, p. 99.

Although the value of crude oil as determined by the yields, quality of products, and refinery operating cost is important, one must never forget that the prices that can be had are simply what the purchaser will, at the moment, pay.

# Monthly Report on PIPELINE CONSTRUCTION

**WHO • WHAT • WHERE • WHEN • HOW LONG**

## PIPELINE CONSTRUCTION

PIPELINE ACTIVITY reported here is compiled from surveys by The Oil and Gas Journal among pipeline companies and construction contractors.

This summary report appears in the last issue of the Journal each month. New construction projects are reported weekly in Pipeline Briefs in the Journal's news section.

Projects are listed in three groups—U. S., Canadian, and Foreign—and according to type of line—crude, products, or natural gas.

## U. S. Crude Oil Pipelines

• **Cape Pipe Line Co.** (Sun Oil Co., Cities Service Co., Atlantic Refining Co.), Philadelphia.

Project: Line from lower Delaware Bay to Philadelphia.

Status: Planned.

Completion: 1960.

• **Gillette Pipeline, Inc.,** and **A. W. Hartwig, Inc.**

Project: A 102-mile line from Dead Horse Creek field to Casper, Wyo.

Status: Pending Wyoming Public Service Commission approval.

• **Great Northern Railway Co.**

Project: 400 to 600 miles of 12 to 20-in. from Williston basin in Mont. and N. D., to Clearbrook or St. Paul, Minn.

Contractor: **Pipe Line Technologists, Inc.,** Houston, has completed feasibility study.

• **International Oil Pipeline Corp.,** New York City.

Project: Would own U. S. section of 1,500-mile, 30-in. line proposed by Mid-Continent Pipe Lines, Ltd., from Edmonton, Alta., to Chicago. (See Canadian Crude-Oil Pipelines).

Status: Pending Canadian Board of Transport Commission approval.

• **International Refineries, Inc.,** Minneapolis.

Project: Gathering lines in Newburg pool in Bottineau Co., N. D.

Status: Has applied to N. D. Public Service Commission for approval.

• **Interstate Oil Pipe Line Co.,** Shreveport, La.

Project: 35 miles of main line plus gathering lines in the Brookhaven District in Miss. Main line will run from Raleigh, Martinville, and Magee fields to connect to company's system just east of Gwinville.

Status: Under way.

Completion: Early December 1958.

• **Jayhawk Pipeline Corp.** (Colorado Oil & Gas Corp., National Cooperative Refinery Association), Wichita, Kans.

Project: 83 miles of 6-in. in Kans. from Meade Station to Interstate Pool.

Status: Under way.

Contractor: **R. H. Fulton & Co.,** Lubbock, Tex.

Completion: November 30, 1958.

Project: 50 miles of 6-in. in Kans. from Meade Station to Pleasant Prairie.

Status: Planned.

Contractor: **E.C.O. Construction Co.**

Completion: December 15, 1958.

• **Mid-Continent Pipe Line Co.,** Tulsa.

Project: 10 miles of 6-in. in Okla. from Tussey area to Tatum area.

Status: Under way.

Contractor: **Gustine Construction Co.,** Ardmore, Okla.

Completion: November 1958.

• **Northwestern Refining Co.,** St. Paul Park, Minn.

Project: Gathering lines in Newburg pool in Bottineau Co., N. D.

Status: Has applied to N. D. Public Service Commission for approval.

• **Shell Pipe Line Corp.,** Houston.

Project: 13 miles of 8-in., 11 miles of 12-in., 31 miles of 16-in., and 65 miles of 20-in. from Mississippi River Delta area to New Orleans refining area.

Status: Under way.

Contractor: **Coates Field Service, Inc.,** Oklahoma City, has right-of-way acquisition and claims settlement. **Houston Contracting Co.,** Houston, has the 20-in. to complete December 1958, R. E. Thornton, spread man.

Completion: February 1959.

Project: 43 miles of 8-in. main line and 20 miles of 4, 6-in. gathering line to extend facilities from Colorado City, Tex., to the Borden-Garza county area of W. Tex.

Status: Under way.

Completion: December 1, 1958.

• **Union Oil Co. of California,** Los Angeles.

Project: 2 miles of 30-in. from proposed outer harbor terminal to Los Angeles outer harbor wharf, and 6 miles of 12-in. crude and bunker fuel line from proposed outer harbor terminal to Union's Los Angeles refinery.

Status: Planned.

Completion: February 1959.

## U. S. Products Pipelines

• **Alaska-Yukon Refiners & Distributors, Ltd.,** Edmonton, Alta.

Project: Two lines: one 150 miles from Haines to Haines Junction, Alaska, linking with government Canol line; another from Tok Junction, on Canol line, to Anchorage, Alaska.

Status: Proposed.

Completion: February 1959.

• **Columbia Gas System, Inc.,** New York City.

Project: 37 miles of 6-in. from Kenova, W. Va., to Siloam, Ky.

Status: Planned.

Completion: December 1, 1958.

• **Cosden Petroleum Corp.,** Big Spring, Tex.

Project: 47 miles of 6-in. between Wichita Falls, Tex., and Duncan, Okla., to be operated by a new, wholly owned subsidiary, River Pipeline Co.

Status: Under way.

Contractor: **Pipe Line Technologists, Inc.,** Houston, is managing; **Holder Construction Co.,** Snyder, Tex., is building the line.

Completion: November 15, 1958.

• **Katy and New York Central Railroads.**

Project: 2,500 miles of 10-in. and smaller LPG line from Houston through Kansas City, St. Louis, Indianapolis, and Cleveland to Syracuse, then down to New York City. A branch would go through Chicago to Detroit.

Status: Proposed.

Contractor: **Williams Brothers Co.,** Tulsa, has completed feasibility study.

Completion: November 1, 1959.

• **Standard Oil Co. (Ind.),** Chicago.

Project: 23 miles of 8-in. near Chicago.

Status: Planned.

Completion: Mid-1959.

• **Texas Eastern Transmission Corp.,** Little Big Inch Div., Shreveport, La.

Project: 10 miles of 8-in. LPG line from Lebanon to Todhunter underground storage in O., and 62 miles of 8-in. from Tyler to Carthage, Tex.

Status: Planned.

• **Underground Storage & Exploration, Inc.,** Upper Darby, Pa.

Project: 393 miles of 12-in. LPG line from Moundsville, W. Va., to Newark, N. J., plus 95 miles of 6, 8-in. laterals to Mauch Chunk, Pa., and to Philadelphia.

Status: Proposed.

• **Union Oil Co. of California,** Los Angeles.

Project: 2 miles of 12-in. bunker fuel line from proposed outer harbor wharf to Los Angeles outer harbor wharf, and 6 miles of 12-in. crude and bunker fuel line from proposed outer harbor terminal to Union's Los Angeles refinery.

Status: Planned.

Completion: February 1959.

• **Wabash Pipe Line Co.** (Ohio Oil Co., Continental Oil Co.), Findlay, O.

Project: 265 miles of 12-in. from Hartford, Ill., to Griffith, Ind.

Status: Under way.

Contractor: **Contract & Materials Co.,** Evanston, Ill.

Completion: November 1, 1958.

• **West Emerald Pipe Line Corp.,** Amarillo, Tex.

Project: 300 miles of 6-in. from Amarillo, Tex., to Albuquerque, N. M.

Status: Under way.

Contractor: **Arey Pipe & Construction Co., Inc.,** Pampa, Tex., has completed 103 miles from Amarillo to Tucumcari, N. M., and has 106 miles between Tucumcari and Albuquerque. **Groninger & King, Inc.,** Pampa, Tex., has 87 miles between Tucumcari and Albuquerque.

Completion: November 15, 1958.

## U. S. Natural Gas Pipelines

• **American Louisiana Pipe Line Co.,** Detroit.

Project: 28 miles of 12-in. Big Lake, La., gathering lines.

Status: Pending FPC approval.

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## PIPELINE CONSTRUCTION

• **Arkansas Louisiana Gas Co.**, Shreveport, La.

Project: A 300-mile line, plus gathering lines, from Tex.-La. coastal area to northern La., to connect with present system.

Status: Proposed.

Project: A 40-mile line to serve Lake Catherine and Lake Hamilton near Hot Springs, Ark.

Status: Under way.

Completion: December 1958.

• **Atlantic Seaboard Corp.**, Charleston, W. Va.

Project: 12 miles of 26-in. in Hardy Co., W. Va., and 6 miles of 26-in. in Shenandoah Co., Va.

Status: Has temporary FPC approval.

• **Capital Gas Pipe Line Co.**, Dallas.

Project: 120 miles of 12, 14-in. main line and 250 miles of 2 to 10-in. gathering lines in Hamilton, Eastland, Erath, Stephens, Palo Pinto, Parker, Coleman, Brown and Comanche counties, Tex.

Status: Under way.

Contractor: **N. A. Saigh Co., Inc.**, San Antonio, Tex.

Completion: January 1, 1959.

• **Carnegie Natural Gas Co.**, Pittsburgh.

Project: Two parallel lines between Clairton and Homestead, Pa., to provide coke-oven gas to six Pittsburgh-area plants; 9 miles of 55-in. and 4 miles of 43-in. each.

Status: Under way.

Contractor: **Williams Brothers Co.**, Tulsa.

Completion: January 1, 1959.

• **Chicago District Pipeline Co.**, Chicago.

Project: 52 miles of 30, 36-in. between Joliet and Chicago.

Status: Approved by FPC examiner.

Completion: 1958.

• **Coastal States Gas Producing Co.** and **Southern Coast Corp.**, Corpus Chrsti, Tex.

Project: 45 miles of 2 to 10-in. in Bee Co., Tex., to connect shut-in fields with Texas Eastern Transmission Corp.'s system.

Status: Planned.

• **Coastal Transmission Corp.**, Houston.

Project: 94 miles of 12-in. from McAllen to Robstown, Tex.; 147 miles of 20-in. from Robstown to Bay City, Tex.; 68 miles of 22-in. from Bay City to Galveston Bay, Tex.; 252 miles of 24-in. from Galveston Bay to Baton Rouge, La.

Status: Under way.

Contractor: **Oklahoma Contracting Co.**, Dallas, has under way 127 miles of 24-in. in La., and will start in November on the 147 miles of 20-in. in Tex.

Completion: April 1959.

Project: 320 miles of 3 to 14-in. gathering lines at various locations on Tex. and La. Gulf Coast.

Status: Approved.

Completion: April 1959.

• **Colorado Interstate Gas Co.**, Colorado Springs, Colo.

Project: 109 miles of 26-in. from Four-Way station in Tex. Panhandle, to Morton Junction in southeastern Colo.; 135 miles of 34-in. from there to Pueblo, and 100 miles of 30-in. on to Denver; 148 miles of 34-in. from CIG line at Rock Springs, Wyo., to Provo, Utah, to connect with proposed El Paso Natural Gas Co.'s line to Calif.

Status: Planned.

Completion: January 1, 1960.

• **Consumers Power Co.**, Jackson, Mich.

Project: 45 miles of 24-in. from Woodbury station to Laingsburg Junction, Mich.

Status: Planned.

Completion: 1959.

Project: 120 miles of 26-in. from Mich.-Ind. border connection with Trunkline Gas Co., to Plymouth, Mich.

Status: Planned.

Completion: Fall 1959.

## PIPELINE CONSTRUCTION

• **Eastern Shore Natural Gas Co.**
Project: 34 miles of 8-in. and 90 miles of 6-in. from connection with Transcontinental Gas Pipe Line Corp., in Md., across Del. to Salisbury.
Status: Under way.
Contractor: **Buchanan Pipe Line Construction Co.,** Birmingham, Ala.
Completion: November 1958.

• **El Paso Natural Gas Co.,** El Paso, Tex.
Project: 79 miles of 10-in. from Quartzsite to Yuma, Ariz.
Status: Under way.
Contractor: **Eastern Pipeline Constructors,** Dallas, John Griffith, supt., spread offices at Quartzsite and Yuma.
Completion: December 1, 1958.
Project: 400 miles of 34-in. from Salt Lake City, to Calif. border near Los Vegas, Nev.
Status: Planned.
Completion: September 1, 1959.
Project: 1,000 miles of main line loop from Plains, Tex., to Calif. border.
Status: Planned:
Completion: 1960.
Project: 12 miles of 4 through 20-in. gathering lines in San Juan basin.
Status: Under way.
Contractor: **B. C. Hall Constructors, Inc.,** Aztec, N. M., C. E. Rutledge, supt.
Completion: End of 1958.

• **Gulf Interstate Gas Co.,** Houston.
Project: 10 miles of 12-in. supply loop to Erath field, Vermilion Parish, La., and 9 miles of various-size field lines in Acadia and Vermilion parishes, La..
Status: Approved.
Project: 10 miles of 20-in. loop in Jefferson Davis and Vermilion parishes, La., and 3 miles of 6-in. loop in Cameron Parish, La.
Status: Has temporary FPC approval.

• **Gulf Resources, Inc., Dallas.**
Project: 125-mile line from Lopeno field in Zapata Co. to a point in LaSalle Co., Tex.
Status: Proposed.

• **Houston Texas Gas & Oil Corp.,** St. Petersburg, Fla.
Project: 702 miles of 24-in. from Baton Rouge, La., to Kissimmee, Fla.; 139 miles of 18-in. and 101 miles of 20-in. from Kissimmee to Cutler, Pa.; 642 miles of 3 to 18-in. sales laterals in Fla. Main line will join Coastal Transmission's line from McAllen, Tex., to Baton Rouge, La.
Status: Under way.
Contractor: **Midwestern-Walco Constructors,** St. Petersburg, Fla., has the 702 miles of 24-in., with spread offices at Denham Springs, La., Lacedale, Miss., and Vernon, Fla. **Harbert Construction Corp.,** Birmingham, has remainder.
Completion: 1959.

• **Humble Oil & Refining Co.,** Houston.
Project: 250 miles of 26 or 30-in. from Sw. Tex. to Houston.
Status: Planned.
Completion: 1960.

• **Iron Ranges Natural Gas Co.,** St. Paul.
Project: 70 miles of 6 to 16-in. in Mesabi Iron Range area.
Status: Pending FPC approval.
Completion: 1959.
Project: 63 miles of 12-in. between Duluth and Silver Bay, Minn.
Status: Pending FPC approval.
Completion: 1959.

• **Kansas-Nebraska Natural Gas Co., Inc.,** Hastings, Neb.
Project: 23 miles of 6-in. from Atwood to Akron, Colo.
Status: Planned.
Contractor: **Brodie Construction Co.,** Amarillo, Tex.
Completion: December 1, 1958.

• **Louisville Gas & Electric Co.,** Louisville, Ky.
Project: 40 miles of 16-in. from Muldraugh to Magnolia, Ky.
Status: Under way.
Contractor: **Williams Brothers Co.,** Tulsa, M. O. Thompson, spread man, office at Louisville, Ky.
Completion: November 1958.

• **Manufacturers Light & Heat Co.,** Pittsburgh.
Project: 9 miles of 8-in. from Steubenville to Wintersville, Ohio.
Status: Planned.
Completion: December 1958.
Project: 9 miles of 8-in. from Berlin to Somerset, Pa.
Status: Planned.
Completion: January 1959.
Project: 7 miles of 10-in. from Wash-


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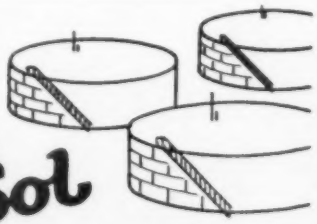

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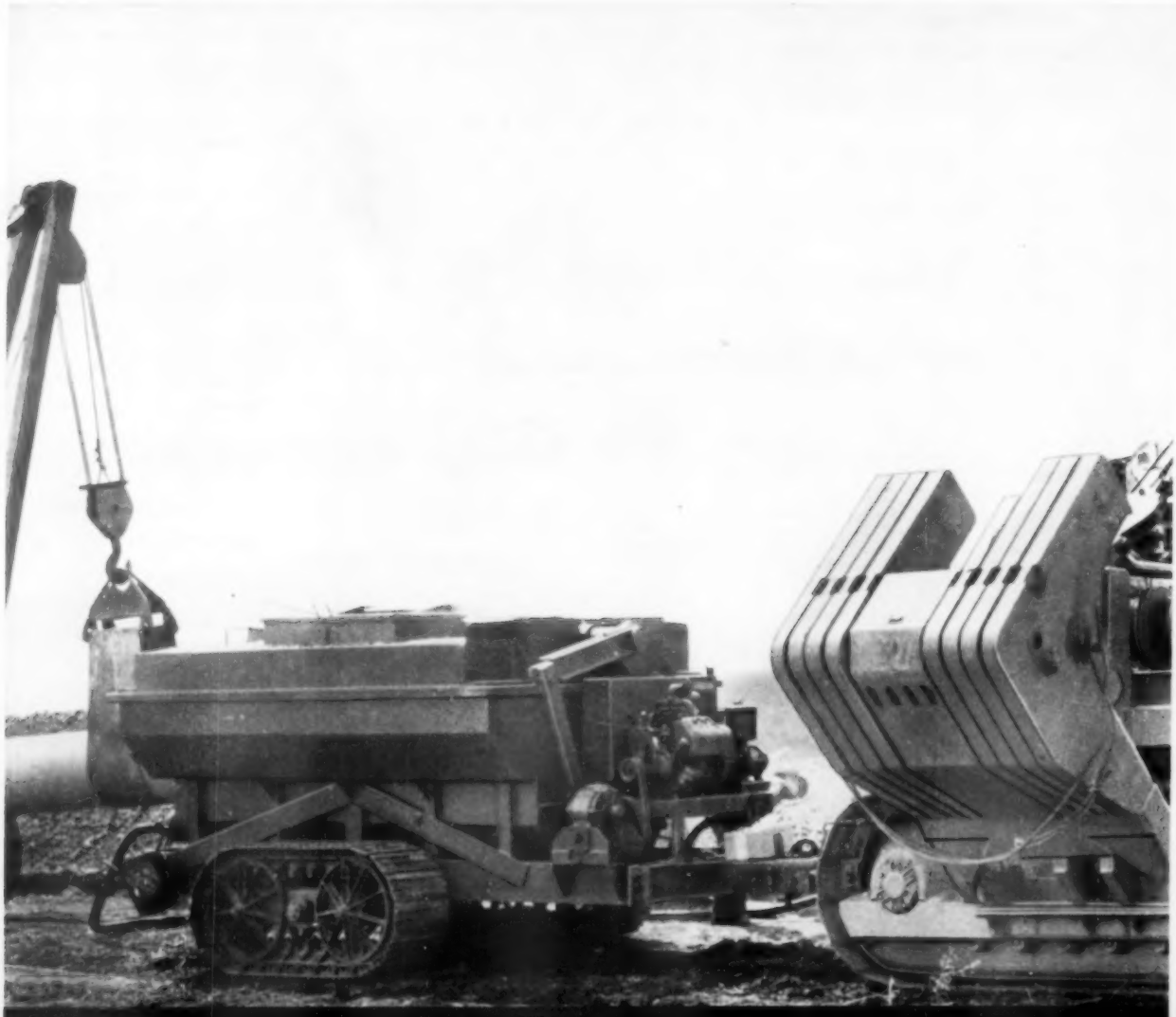

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# TRACTOMOTIVE

## PIPELINE CONSTRUCTION

ington, Pa., to 84 Town, Pa.
Status: Under way.
Contractor: **A. J. Curtis & Co.,** Hickory, Pa., O. F. Bradford, supt.
Completion: November 1958.

• **Michigan Consolidated Gas Co.,** Detroit.
Project: 67 miles of 10, 12-in. between Sears and Traverse City, Mich.
Status: Under way.
Contractor: **Somerville Construction,** Ada, Mich., Floyd Huduall, supt., office at Cadillac, Mich.
Project: 60 miles of 10, 12-in. between Muskegon and Ludington, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.,** Ada, Mich., jointly with **H. L. Gentry Construction Co.,** Jackson, Mich., Frank Morris, supt., office at Hart, Mich.

• **Michigan Wisconsin Pipe Line Co.,** Detroit.
Project: 13 miles of 8-in. loop near Fort Madison, Iowa, and 25 miles of 12-in. near Madison, Wis.
Status: Work started September 15, 1958.
Contractor: **G. E. T. Construction, Inc.,** Milwaukee, Dewey Moore, spread man on Madison loop; Emmett Hunter, spread man on Iowa loop.

• **Mississippi River Fuel Corp.,** St. Louis.
Project: 38 miles of 26-in. loop between Bald Knob, Ark., and Perryville, La.
Status: Pending FPC approval.
Completion: December 1958.

• **Natural Gas Pipeline Co. of America,** Chicago.
Project: 232 miles of 36-in. between Beatrice, Neb., and Joliet, Ill., and 258 miles of 36-in. and 21 miles of 26-in. between Tex. Panhandle and Beatrice.
Status: Has temporary FPC approval. Under way.
Contractor: **H. R. Fulton & Co.,** Lubbock, Tex., has 21 miles of 26-in. and 102 miles of 36-in. between Fritch, Tex., and Kans. line, and 105 miles of 36-in. in Kans. **Williams Brothers Co.,** Tulsa, has 106 miles of 36-in. in Kans. and Neb., terminating near Emerson, Iowa, and 99 miles of 36-in. from there to Harper, Iowa. **Contracting Materials Co.,** Chicago, has 82 miles of 36-in. from Harper, Iowa, to Joliet, Ill.
Completion: January 1, 1959.

• **North Carolina Natural Gas Corp.,** Fayetteville, N. C.
Project: 730 miles of 2 to 16-in. from near Mooresville, eastwardly across N. C.
Status: Under way.
Completion: Late 1958.

• **Northern Illinois Gas Co.**
Project: 140 miles of 24-in. from Des Plaines to East Dubuque, Ill.
Status: Pending FPC approval.
Contractor: **Williams Brothers Co.,** Tulsa, has completed engineering and right-of-way studies.

• **Northern Natural Gas Co.,** Omaha, Neb.
Project: 18 miles of 20-in. from Dubuque, Iowa, to Menominee, Ill.
Status: Pending FPC approval.
Project: 19 miles of 30-in. from S. Sioux City to Oakland, Neb.
Status: Pending FPC approval.
Project: 9 miles of 30-in. from Palmyra to Beatrice, Neb.
Status: Pending FPC approval.
Project: 11 miles of 30-in. from Clifton to Tescott, Kans.
Status: Pending FPC approval.
Project: 8 miles of 30-in. from Tescott to Bushton, Kans.
Status: Pending FPC approval.
Project: 11 miles of 30-in. from Sunray, Tex., to Beaver, Okla.
Status: Pending FPC approval.
Project: 8 miles of 30-in. and 44 miles of 16-in. from Beaver, Okla., to Mullinville Kans.
Status: Pending FPC approval.
Project: 169 miles of 20-in. from Farmington, Minn., to Superior, Wis.
Status: Pending FPC approval.
Project: 23 miles of 24-in. main line loop in Neb.
Status: Pending PFC approval.
Project: 43 miles of 20-in. main line loop in Kans., Neb., and La.
Status: Pending FPC approval.
Project: 44 miles of 16-in. in Duluth-Superior, Wis., area.
Status: Pending FPC approval.
Project: 1,100 miles of 26-in. from Mont. border to Minneapolis. (See Northern Natural Gas Co. in Canadian Natural Gas Pipeline section.)
Status: Planned.
Project: 1,090 miles of 2 to 16-in. branch lines in Minn., La., S. D., Neb. and Wis.
Status: Pending FPC approval.
Project: 57 miles of 30-in. main line loop in Neb. and Kans.
Status: Pending FPC approval.

• **Northern Utilities Co.,** Casper, Wyo.
Project: 35 miles of 16-in. in Fremont-Natrona counties, Wyo.; 8 miles of 12-in. near Casper, Wyo.; 6 miles of 8-in. from Sand Draw gas field to Beaver Creek field, Wyo.; 12 miles of 6-in. from Beaver Creek field to the system servicing the Riverton-Lander, Wyo., area.
Status: Planned.

• **Offshore Gathering Corp.,** Houston.
Project: 364 miles in Gulf of Mexico off La.: 60 miles of 24-in., 70 miles of 26-in., and 234 miles of 30-in. dual line.
Status: Pending FPC approval.

• **Pacific Lighting Gas Supply Co.,** Los Angeles.
Project: 128 miles of 34-in. from Topock to Newberry, Calif.
Status: Filed April 1958 for California Public Utilities Commission approval.
Completion: November 1, 1959.

• **Pacific Northwest Pipeline Corp.,** Salt Lake City.
Project: 40-mile line from Ute Trail fields in northeastern Utah, to its main line in western Colo.
Status: Under way.

• **Panhandle Eastern Pipe Line Co.,** Kansas City, Mo.
Project: 68 miles of 4-in., 37 miles of 6-in., 35 miles of 8-in., and 12 miles of 12-in. gathering lines in Kans., Okla., and Tex.
Status: Under way.
Contractor: **B. C. Hall Constructors, Inc.,** Aztec, N. M.
Completion: December 31, 1958.

• **Pennsylvania Gas Co.,** Warren, Pa.
Project: 23 miles of 10-in. in Erie Co., Pa., 15 miles of 8-in. in Warren and Chautauqua counties, Pa.; 30 miles of branch lines, and several small distribution lines.
Status: Approved.

• **Permian Basin Pipeline Co.,** Omaha, Neb.
Project: 61 miles of 16-in. and 11 miles of field lines in Winkler Co., Tex.
Status: Pending FPC approval.

• **Piedmont Gas Co.,** Hickory, N. C.
Project: 78 miles of 2 to 8-in. extension off Transcontinental in N. C., to serve Gaston, Lincoln, Catawba, Caldwell, and Burke counties.
Status: Approved.

• **Pioneer Gathering System, Inc.,** Amarillo, Tex.
Project: 62 miles of 10-in. from Pampa to Canyon, Tex., plus 20 miles of small size gathering lines.
Status: Planned.

• **Signal Oil & Gas Co.,** Los Angeles.
Project: Extension of gathering system from Tioga, N. D., to near the Canadian border in Burke Co.
Status: Being considered.

• **Southern California Gas Co.,** Los Angeles.
Project: 186 miles of 34-in. from Ivanpah Lake to Placentia, Calif.
Status: Proposed.

• **Southern Natural Gas Co.,** Birmingham, Ala.
Project: 69 miles of 24-in. from Toca to Franklinton, La.
Status: Under way.
Contractor: **Williams Brothers Co.,** Tulsa, has 42 miles from Lake Pontchartrain to Franklinton. **Western Pipeline, Inc.,** Austin, Tex., has 27 miles.
Project: 83 miles of 24-in. from Gallion to Elmore, Ala.
Status: Under way.
Contractor: **Houston Contracting Co.,** Houston, has had under way since mid-October, 40 miles from near Gallion, eastwards towards Elmore, M. C. Thompson, supt., office at Selma, Ala.
Project: 43 miles of 20-in. and 46 miles of 24-in. from Elmore to Ellerslie, Ga., 67 miles of 24-in. from Gwinville to Enterprise, Miss., 71 miles of 24-in. from Enterprise to Gallion, Ala., 69 miles of 20-in. from Ellerslie to Ocmulgee, Ga.
Status: Under way.
Contractor: **H. C. Price Co.,** Bartlesville, has 75 miles of 24-in. and 47 miles of 20-in. in Ala., Miss., and Ga., G. A. Reutzel, supt., office at Manchester, Ga. **Houston Contracting Co.** has 67 miles of 24-in. in Miss. and Ala.,
Project: 8 miles of 6-in. loop at Vicksburg, Miss., 5 miles of 12-in. loop at Amory, Miss., 9 miles of 8-in. loop at Calera, Ala., 9 miles of 8-in. loop at LaGrange, Ga., 8 miles of 20-in. from Gwinville to Pickens, Miss.
Status: Under way.
Contractor: **Ford, Bacon & Davis, Inc.,** New York City.
Project: Supply lines in S. La.: 9 miles of 16-in. Bayou Long field lateral, 7 miles of 16-in. Little Bayou Pigeon lateral, 4 miles of 6-in. Mystic Bayou field lateral, 2 miles of 6-in. East Bayou Pigeon lateral, 13 miles of 10-in. Tantine field lateral, 46 miles of 20-in. from White Castle to South Section 28 field, 7 miles of 10-in. Bayou Boullion field, 11 miles of 8-in. East Happytown field lateral, 8 miles of 10-in. and 11 miles of 8-in. Loisel field lateral, 16 miles of 20-in. Lake Washington field lateral, 25 miles of 12-in. West Delta Block 30 lateral, 4 miles of 8-in. Bayou Long field lateral, 6 miles of 4-in. Bayou Villars field lateral, 12 miles of 6-in. Marrero field lateral, 6 miles of 6-in. South Lake Long field lateral, 1 mile of 4-in. Tigers Ridge field lateral, 35 miles of 16-in. Barataria Line loop.
Status: Approved.
Contractor: **Western Pipeline, Inc.,** Austin, Tex., has 46 miles of 20-in., 14 miles of 16-in., 14 miles of 10-in., 23 miles of 8-in., and 7 miles of 6-in. **Brown & Root, Inc.,** Houston, has 16 miles of 20-in., 14 miles of 16-in., 25 miles of 12-in., 2 miles of 8-in., 12 miles of 6-in., and 6 miles of 4-in.
Project: 79 miles of 16-in. from Ocmulgee to Wrens, Ga., 23 miles of 14-in. loop at Rome, Ga., 62 miles of 14-in. from Ocmulgee to Atlanta, Ga.
Status: Pending FPC approval.
Contractor: **Latex Construction Co. of Georgia,** Atlanta, has 22 miles of 14-in.
Project: Facilities to attach additional supplies in S. La.: 6 miles of 8-in. from Ship Shoals Block 28 to Block 32, 29 miles of 16-in. from Ship Shoals Block 28 to Atchafalaya Bay, 15 miles of 16-in. from north shore Atchafalaya Bay to Patterson, 6 miles of 16-in. from Patterson to Duck Lake, 8 miles of 6-in. Bayou Felice lat-

## PIPELINE CONSTRUCTION

eral, 1 mile of 4-in. Triumph field lateral, 2 miles of 8-in. Coffee Bay field lateral, 2 miles of 4-in. Bayou Postillion lateral.

Status: Pening FPC approval.

Completion: 1958-1959.

Project: Facilities to attach additional supplies in Miss.: 8 miles of 8-in. Hub field lateral, 40 miles of 14-in. and 40 miles of 16-in. from Cranfield to Gwinville, 3 miles of 8-in. Dexter field lateral.

Status: Pending FPC approval.

Completion: 1958-1959.

- **Tennessee Gas Transmission Co.,** Houston.

Project: 556 miles of 30-in. from Miss. Delta area south of New Orleans to Portland, Tenn.,; 163 miles of 30-in. and 101 miles of 26-in. from Portland to near Lancaster, Ky., from Winchester, Ky., to Morehead, Ky., from Catlettsburg, Ky., toward Broad Run, W. Va., from New Wilmington, Pa., to Mercer, Pa., and from Morehead to Catlettsburg.

Status: Approved. Under way.

Contractor: **Oklahoma Contracting Co.,** Dallas, has 90 miles from Columbia, Miss., to the Tenn. River, Ed Peters, supt. **Sharman, Allen, Gay & Taylor,** Houston, has completed 28 miles in La. and Miss. **Houston Contracting Co.,** Houston, has completed 37 miles in Plaquemines and St. Bernard parishes, La. **Western Pipeline, Inc.,** Austin, Tex., has 80 miles terminating south of Dickson, Tenn., to complete late Nov. 1958. **Bechtel Corp.,** San Francisco, has completed 75 miles of 30-in. from Portland to Centerville, Tenn. **Grayco Constructors, Inc.,** Austin, Tex., and **Panama, Inc.,** Houston, have remainder.

Project: 21 miles of 16-in. and 2 miles of 12-in. to offshore La. fields.

Status: Pending FPC approval.

- **Tensas Gas Gathering Corp.**

Project: 37 miles of 2 to 8-in. from Rodney field, Miss., westerly to connect with Olin Gas Transmission Co.'s line in Tensas Parish, La.

Status: Approved.

- **Texas Eastern Transmission Corp.,** Shreveport, La.

Project: 17 miles of 8-in. and 3 miles of 6-in. from its 20-in. Baytown-Hankamer line to Alco-Mag field in Harris Co., Tex.

Status: Approved.

Project: 22 miles of 14-in. from Rayne field to near Opelousas, La., and 12 miles of 16-in. in Acadia Parish, La.

Status: Under way.

Contractor: **Houston Contracting Co.,** Houston.

Completion: November 1958.

- **Texas Gas Transmission Corp.,** Owensboro, Ky.

Project: 92 miles of 30-in. looping near Alexandria and Bastrop, La., and near Greenville and Clarksdale, Miss.

Status: Pending FPC approval.

Project: 13 miles of 16-in. looping in Jefferson Davis and Acadia parishes, La.

Status: Under way.

Contractor: **Houston Contracting Co.**

Completion: November 1958.

Project: 19 miles of 26-in. looping near Hardinsburg and West Point, Ky.

Status: Pending FPC approval.

Project: 15 miles of 16-in. and smaller looping near Henderson, Ky., Petersburg and Linton, Ind., and Lawrenceville, Ill.

Status: Pending FPC approval.

- **Texas Illinois Natural Gas Pipeline Co.,** Chicago.

Project: 860 miles of 30-in. looping of present system.

Status: Planned.

Completion: 1960-1961.

- **Transcontinental Gas Pipe Line Corp.,** Houston.

Project: 107 miles of 30-in. and 205 miles of 36-in. main line looping in various states.

Status: Under way.

Contractor: **Bechtel Corp.,** San Francisco, has 55 miles of 36-in. and 8 miles of 30-in. in N. J. and Pa., Lon Nassar, office mgr. at Coatsville, Pa., and 70 miles of 36-in. in Ala., Ga., and S. C., H. F. "Hank" Mogg, supt., office at Selma, Ala.. **Sharman, Allen, Gay & Taylor,** Houston, has 87 miles of 30 and 28 miles of 36-in. loops in Tex., La., and Miss., E. D. Singleton, supt. **J. P. Neill & Co.** has 11 miles of 30-in. and 57 miles of 36-in. in N. C. and Va.

Completion: November 1958.

Project: 1 mile of 30-in. and 51 miles of 36-in. main line loops in various states.

Status: Approved by FPC examiner.

Completion: 1959.

Project: 445 miles of 24-in. and smaller purchase laterals in Tex. and La.

Status: Under way.

Contractor: **H. C. Price Co.,** Bartlesville, has 65 miles in La., R. L. Ezell, supt., office at Amite, La.

Completion: Last half of 1958.

Project: 29 miles of 30-in. and 164 miles of 23-in. from Leidy storage field in Pa., to its trunk line to N. Y.

Status: Under way.

Contractors: **Sharman, Allen, Gay & Taylor,** Houston, has 65 miles (of which 27 miles is sublet to **Harford Bros.,** Emporium, Pa.) J. A Adams, supt., office at Renova, Pa. **Panama-Williams Corp.,** Houston, has remainder, M. B. Henderson supt., office at Hughesville, Pa., W. H. Shifflett, supt., office at Wilkes Bare, Pa.

Completion: November 15, 1958.

Project: 52 miles of 10, 14-in. purchase laterals in Tex. and La.

Status: Approved by FPC examiner.

Completion: 1959.

- **Transwestern Pipe Line Co.** (Warren Petroleum, Monterey Oil Co., J. R. Butler), Dallas.

Project: 635 miles of 24-in. from Perryton and Fort Stockton, Tex., to Roswell, N. M., and 670 miles of 30-in. from Roswell to Topock, Ariz.

Status: Pending FPC approval.

Completion: Mid-1959.

- **Trunkline Gas Co.,** Houston.

Project: 464 miles of 30-in. looping between Longville, La., and Tuscola, Ill.; 44 miles of 24-in. looping in Tex.; 204 miles of 26-in. extension of main line from Tuscola to Vistula, Ind., to connect with Consumers Power Co.

Status: Pending FPC approval.

Completion: Fall 1959.

Project: 24, 26-in. Red River crossing in Rapides Parish, La.

Status: Under way.

Contractor: **Missouri Valley Dredging Co.,** Omaha.

Completion: January 1959.

Project: 143 miles of 12 to 20-in. and 40 miles of 4 to 10-in. purchase laterals.

Status: Planned.

- **United Gas Pipe Line Co.,** Shreveport, La.

Project: 117 miles of 30-in. looping from SE La., to Mobile, Ala.

Status: Approved. Under way.

Contractor: **O. R. Burden Construction Corp.,** Tulsa, has the 28-mile Lake Pontchartrain crossing.

Project: 15 miles of 12-in. from N. Henderson field to Carthage-Longview main line.

Status: Planned.

Completion: End of 1958.

Project: 9 miles of 16-in. from Belle Isle field offshore La., to Kosciusko main line.

Status: Planned.

Completion: End of 1958.

## Canadian Crude Oil Pipelines

- **Act Oils, Ltd.**

Project: A 450-mile line from the Peace River region of northern B. C. to tidewater at Kitimat, B. C.

Status: Pending British Columbia Government approval.

- **B-A Alberta Pipe Line, Ltd.,** Calgary, Alta.

Project: 35 miles of 8-in. to connect Drumheller field, Alta., with existing lines running to Edmonton.

Status: Pending approval.

- **Bituminous Oil Pipeline Co.** (Royalite Oil Co., and Can-Amera Oilsands Development, Ltd.)

Project: A 250-mile line from Athabasca oil sands in northeastern Alta., to Edmonton.

Status: Proposed.

Completion: 1960.

- **Independent Pipe Line Co.** (Home Oil Co.), Calgary.

Project: 1,073 miles of 36-in. from Edmonton, Alta., to Superior, Wis.; 946 miles of 34-in. from Superior to Montreal, Que.; 72 miles of 16-in. and 74 miles of 10-in. feeder lines from Calgary to Bellshill Lake, Alta., on the 36-in. line.

Status: Proposed.

- **Mid-Continent Pipe Lines, Ltd.**

Project: 1,500 miles of 30-in. from Edmonton to Chicago, via Sask., N. D., Minn., Wis., and Ill. U. S. section to be owned by International Oil Pipeline Corp., New York City.

Status: Pending Canadian Board of Transport Commission approval. **W. C. Gilman & Co.,** New York City, has made preliminary study.

- **Peace River Oil Pipe Line Co., Ltd.,** Calgary, Alta.

Project: 8 miles of 6-in., 45 miles of 8-in., and 17 miles of 12-in. from its Fox Creek Pump Station to Windfall, Virginia Hills, and Swan Hills fields in Alta.

Status: Approved.

- **Westcoast Transmission Co., Ltd.,** Calgary.

Project: Line to parallel its 650-mile, 30-in. gas line from Peace River to Vancouver, B. C.

Status: Under way.

## Canadian Products Pipelines

- **Foothills Products Pipe Line, Ltd.** (Pembina Pipe Line Co., Mannix Co., Ltd.), Calgary, Alta.

Project: Gathering system to connect Alta. gasoline plants to trunk line from Alta. to Pacific Coast.

Status: Proposed.

- **Hydrocarbons Pipeline Co.,** Winnipeg, Man.

Project: 800 miles of 6, 8-in. LPG line from near Edmonton to Fort William, Ont.

Status: Has Parliament of Canada approval. Seeking approval of Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board.

Contractor: **Dutton - Williams Brothers, Ltd.,** Calgary, and **A. D. Little Co.,** Boston, are consultants.

## Canadian Natural Gas Pipelines

- **Alberta & Southern Transmission Co., Ltd.**

Project: 1,300 miles of 36-in. from Alta., to San Francisco, plus 47 miles of gathering lines.

Status: Planned.

Completion: 1960.

- **British American Oil Co., Ltd.,** Toronto.

## PIPELINE CONSTRUCTION

Project: 20 miles of 2 to 14-in. in Pincher Creek, Alta.

Contractor: **Mannix Co., Ltd.**, Calgary, R. L. Tulford, supt.

- **Northern Natural Gas Co.**, Omaha.

Project: 73 miles of 20-in. from Savanna Creek to Pincher Creek, Alta.

Status: Planned.

Project: 32 miles of 24-in. from Pincher Creek to Mont. border to tie in with planned U. S. line on to Minneapolis.

Status: Planned.

- **Northern Ontario Natural Gas Co., Ltd.**, Port Arthur, Ont.

Project: 90 miles of 10-in. from North Bay to Sudbury, Ont.

Status: Under way.

Contractor: **Mannix Co., Ltd.**, Calgary, Alta., V. D. Worcester, supt., office at Verner, Ont.

Completion: Late fall 1958.

- **Northern Ontario Pipe Line Crown Corp.**, Ottawa, Ont.

Project: 675 miles of 30-in. from the Ont.-Man. border to near Kapuskasing, Ont. (part of the 2,250-mile Trans-Canada line; will be leased to Trans-Canada Pipe Line Co. with option to buy); 360 miles from Port Arthur to Kapuskasing remains to be laid in 1958.

Status: Under way.

Contractor: **B. C. River Construction, Ltd.**, Longlac, Ont., has completed 91 miles from Longlac to Shekak River 30 miles west of Hearst. **Mannix Co., Ltd.**, Calgary, has 92 miles from 35 miles west of Hearst to Kapuskasing, Odis Hare, supt., office at Hearst. **Nelen, Ltd.**, Toronto, Ont., has 63 miles from Port Arthur to Nipigon River. **Majestic Contractors, Ltd.**, Edmonton, Alta., has 71 miles from Broadmore to Longlac. **Morrison-Shivers, Ltd.**, Dryden, Ont., has 48 miles from Nipigon River to Broadmore. **Pentzien Canada, Ltd.**, Toronto, has three major river crossings.

Completion: November 1958.

- **Van Tor Oil & Exploration Co.**, Vancouver, B. C.

Project: Line from B. C. mainland to Vancouver Island.

Status: Proposed.

Completion: 1960.

- **Westcoast Transmission Co., Ltd.**, Calgary.

Project: Looping of present system to double capacity.

Status: Planned.

## Foreign Crude Oil Pipelines

- **Arabian American Oil Co.**, Dhahran, Saudi Arabia.

Project: 9 miles of 32-in. loop from Abqaiq toward Shedgum.

Status: Planned.

Completion: 1960.

Project: 17 miles of 32-in. extension of loop from Abqaiq toward Shedgum.

Status: Planned.

Completion: 1961.

Project: 9 miles of 30-in. extension of loop from Abqaiq toward Shedgum.

Status: Planned.

Completion: 1960.

Project: 12 miles of 30-in. extension of loop from Abqaiq toward Shedgum.

Status: Planned.

Completion: 1961.

Project: 54 miles of 30-in. loop of Safaniya-Ras Tanura line.

Status: Planned.

Project: 63 miles of 30, 32-in. from Khursaniyah to Ras Tanura.

Status: Planned.

- **Assam Oil Co.**, Digboi, Lakhimpur District, Assam, India.

Project: 600 miles of 20-in. from Nahorkatiya field in Upper Assam to Barauni, India, to connect with Burmah Oil Co.'s proposed 250-mile line from Barauni to Calcutta.

Status: Survey of possible routes under way.

Contractor: **Pipe Line Engineering Co.**, Dallas, is making survey.

- **Bolivia-Paraguay.**

Project: 500 miles of 6-in. from Southeast Bolivia to a proposed refinery on Paraguay River, and later to Asuncion.

Status: Planned.

- **Burmah Oil Co., Ltd.**, Glasgow, Scotland.

Project: 250 miles of 20-in. from Barauni to Calcutta, India, extending Assam Oil Co.'s proposed line.

Status: Survey under way.

Contractor: **Collins Construction Co.**, Port Lavaca, Tex., is surveying locations for about 40 river crossings.

- **Cia. Shell de Venezuela.**

Project: 70 miles of 30, 34-in. heated line from Bachaquero to Puerto Miranda, and an unheated 31in. parallel to the section from Cabimas to Puerto Miranda.

Status: Under way.

Contractor: **Williams Brothers Sudamericana, Ltd.**

- **Colon Oil Co.**, Caracas, Venezuela.

Project: 34 miles of 8-in. from El Rosario to Calvario in Venezuela.

Status: Planned.

Completion: February 1959.

- **Colombian Petroleum Co.**

Project: 42 miles of 6-in from Tibu field to Rio de Oro in Colombia, S. A.

Status: Under way.

- **C.R.E.P.S., Societe Nationale de Recherche et d'Exploration des Petroles en Algerie (SN Repal)** and **Cie. Francaise des Petroles Algerie**, Paris, France.

Project: 450 mile sof 16-in. from Edjele field in southeastern Algeria to a Mediterranean port on the Libyan coast.

- **Elburz Oil Corp.**

Project: 1,000 miles of 38-in. to move Qum crude to the Mediterranean.

Status: Planned.

- **Iranian Oil Participants, Ltd.**

Project: 30 miles of 20-in. and 22 miles of 16-in. looping of Agha Jari to Bandar Mashur line.

Status: Planned.

Project: 50 miles of 26, 28-in. from Gach Saran field to new terminal at Kharg Island in the Persian Gulf.

Status: To start November 1958.

Contractor: A joint venture of **Raymond Concrete Pile Co.** and **Williams Bros. Co.**, Tulsa, **Richard Costain, Ltd.**, and **John Brown, Ltd.**, London, and **Werkspoor & Bredoro**, The Netherlands.

- **Iraq Pettroleum Co.**, London.

Project: 600 miles of up to 40-in. from Kirkuk field through Iraq to Turkish port of Iskenderun on the Mediterranean.

Status: Proposed. Survey completed.

Project: 76 miles of 30-in. looping along the Kirkuk-Banias line.

Status: Under way.

Completion: Early 1959.

- **Kuwait Oil Co., Ltd.**, London.

Project: 61 miles of 30-in. from Raudhatain area to Ahmadi.

Status: Under way.

Completion: June 1959.

Project: 7 miles of 38, 40-in. No. 11 Gravity Line from North Ahmadi Tank Farm to North Pier.

Status: Planned.

Completion: December 1958.

Project: 7 miles of 38, 40-in. No. 12 Gravity Line.

Status: Planned.

Completion: April 1959.

- **Middle East Pipeline.**

Project: 1,500 miles of 38, 40-in. from Persian Gulf to Mediterranean at Iskenderun, Turkey.

- **North-West Oil Pipeline Co.** (newly formed by six West German refiners, headed by affiliates of Standard Oil Co. (N. J.) and British Petroleum Co., Ltd.).

Project: 230 miles of 28-in. from refining centers in the industrial Ruhr area of West Germany to Wilhelmshaven.

Status: Under way.

Contractor: **W. M. Lyles** jointly with two German steel firms.

Completion: November 1958.

- **Petroleo Brasileiro S. A. (Brazil).**

Project: 40 miles of 12-in. from Catu to Madre de Deus in Bahia.

Status: Under way.

Contractor: **Techint, Inc.**

Project: 80 miles of 24-in. to tie in to proposed Caxias refinery near Rio de Janeiro.

Status: Planned.

- **Rotterdam-Rhine Pipeline Co.** (Caltex Petroleum Maatschappij, Bataafsche Petroleum Maatschappij, Gelsenberg Benzin A. G., and Moiloil A. G.)

Project: 59 miles of 30-in. and 96 miles of 24-in. from Rotterdam to Ruhr industrial area in West Germany to supply refineries at Godorf and Wesseling, and a 25-mile branch to Wessel to serve the refinery in Gelsenkuchen.

Status: Under way.

Contractor: **Bechtel International Co.** is managing the engineering and construction, W. C. Anthony, chief of construction operations, office at The Hague. Contract has been let for 33 miles of 24-in. in south Holland, and for 4 major submarine crossings.

Completion: Mid-1960.

- **Royal Dutch-Shell.**

Project: 700-mile line across Europe from the Mediterranean to the North Sea, running through eastern France, Luxembourg, West Germany, Netherlands, and Belgium. Main line to be 30-in.

Status: Considering project as joint venture with several other companies.

- **SOPEG** (construction organization for Cie. Francaise des Petrole (Algerie) and Ste. Nationale de Recherche et d'Exploitation des Petroles en Algerie).

Project: 412 miles of 24-in. from Hassi Messaoud field in the Algerian Desert to Bougie on the Mediterranean Coast.

Status: Under way.

Contractor: **Entrepose Co.** and **Ste. Parisienne pour Industrie Electrique** have 281 miles. **SOCOMAN** and **Eau Assainissement** have 131 miles.

Completion: Late 1959.

- **South European Pipeline Co.** (Jersey Standard, Caltex, and 17 European firms).

Project: 932 miles of 30-in. from Marseilles, France, to Hamburg, Germany.

Status: Proposed.

- **Union of Soviet Socialist Republic.**

Project: 2,315 miles of 28-in. Trans-Siberian crude-products line from Ufa Tuimaza fields in Bashkiria to Irkutsk near Lake Balkal.

Status: Under way.

Project: 600-mile line from Russian fields to Czechoslovakia.

Status: Planned for 1960.

Project: Line from Russian fields to East Germany, possibly as part of a petrochemical expansion program.

Status: Planned.

- **Yacimientos Petroliferos Fiscales (Argentina)**, Buenos Aires.

Project: 815 miles of 12-in. from Campo Duran to San Lorenzo.

Status: Under way.

Contractor: **SARGO** (Fish Engineering

## PIPELINE CONSTRUCTION

Corp., Fish Northwest Constructors, Inc., Clark Brothers, North American Utility, Construction International Co.).

Completion: Mid-1960.

Project: 390 miles of 14-in. from fields in Neuquen Province, Argentina, to Bahia Blanca on the coast.

Status: Bids requested.

Project: 625 miles of 12-in. from Mendoza to San Lorenzo.

Status: Planned.

### Foreign Products Pipelines

- **Empresa Nacional de Petroles Government of Chile** and **Cia. de Petroles de Chile (Copec), et al.,** Santiago, Chile.

Project: 75 miles of 10-in. from Chile's coastal refinery at Concon to Santiago.

Status: Planned.

Completion: Late 1958.


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- **National Iranian Oil Co.,** Azna, Iran.

Project: 200 miles of 6 and 8-in. extension of the Trans-Iranian line from Teheran northward to Resht on the Caspian Sea.

Status: Under way.

Contractor: **B. & M. Construction Co.,** Oklahoma City; **Cheney Construction Co.,** Seattle; **Merritt-Chapman & Scott,** New York City.

Completion: April 1959.

- **Union of Soviet Socialist Republic.**

Project: 2,315 miles of 28-in. Trans-Siberian crude-products line from Ufa Tuimaza fields in Bashkiria to Irkutsk near Lake Balkal.

Status: Under way.

- **Yacimientos Petroliferos Fiscales (Argentina),** Buenos Aires.

Project: 652 miles of 10-in. from Lujan de Cuyo to Buenos Aires.

Status: Bids opened August 1958.

### Foreign Natural Gas Pipelines

- **Attock Oil Co., Ltd.,** London.

Project: 60 miles of line from Dhulian field to Rawalpindi in West Pakistan.

Status: Planned.

- **Cuban Gas Transmission Co.**

Project: 500-mile line from Campeche area of Mexico across Yucatan and a 150-mile line on the ocean floor to Havana.

Status: Under study by **Ebasco Services.**

- **Ferngas.**

Project: 45 miles of 12-in. from Semmering to Donawitz, Austria.

Status: Planned.

Contractor: **Mannesmann,** a German steel and construction firm.

Completion: Last half of 1958.

- **Gaz de France.**

Project: 550 miles of 16 to 24-in. from Lacq field in southwestern France to Paris, plus 12 to 16-in. laterals to Lyons, making a 1,000-mile system.

Status: Under way.

Contractor: French contractors.

Completion: Line to Lyons to be completed March 1959; line to Paris in 1960.

- **Petroleos Mexicanos,** Mexico D. F.

Project: 130 miles of 22-in. to parallel a 14-in. line from Reynosa to Monterrey.

Project: 490 miles of 24-in. artery from Jose Colomo field in the State of Tabasco to Mexico City.

Status: Preliminary work under way.

Completion: March 1960.

- **Sui Gas Transmission Co.,** Multan, Punjab, India.

Project: 130-mile extension of the new 310-mile, 16-in. Multan-to-Sui, Pakistan line. Extension will terminate at Lyallpur.

Status: Planned.

- **Union of Soviet Socialist Republic.**

Project: A 465-mile line from Karadag near Baku to Tbilisi and Erevan.

Status: Under way.

Completion: 1960.

Project: A 127-mile line across the Turkmenian Desert from Kizyl-Kum to the Caspian Sea port of Krasnovodsk.

Status: Under way.

- **Yacimientos Petroliferos Fiscales (Argentina),** Buenos Aires.

Project: 1,015 miles of 24-in. from Camp Duran to Buenos Aires.

Status: Under way.

Contractor: **SARGO** (Fish Engineering Corp., Fish Northwest Constructors, Inc., Clark Brothers, North American Utility, Construction International Co.).

Completion: Mid-1960.

Project: Line from Comodoro Rivadavia to Buenos Aires with a spur to Plaza Huincul field in Neuquen province. Line will be 26-in. to the connecting point for the Plaza Huincul link and 30-in. from the connection to Buenos Aires.

Status: Proposed.


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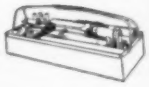

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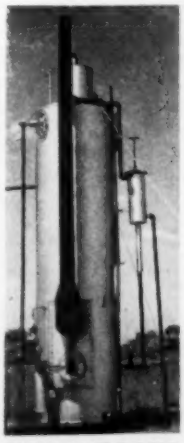


MFD BY M&V TANK COMPANY WICHITA FALLS TEXAS

**TYPE H-E LOW PRESSURE TREATING SEPARATORS**

**M&V TANK COMPANY**
Wichita Falls, Texas
*TANKS-TREATERS*
*SEPARATORS*
Steel Fabrication
for the Oil Industry

## ▶▶▶ Among the Drilling Contractors

**HERE ARE** some of the officers, chosen at the recent Dallas convention, who will guide the affairs of the American Association of Oilwell Drilling Contractors during the coming year, effective January 1, 1959. Top row, left to right: A. Earl White, Mustang Drilling Corp., Tyler, Tex., vice president for Cretaceous and Tertiary basins; W. W. Hawkins, Win Hawkins Drilling Co., Lafayette, La., vice president for offshore areas; Don Slape, Don Slape Drilling Co., Olney, Ill., vice president for Illinois, Michigan, Indiana, and Kentucky; H. Don Johnson, Carl B. King Drilling Co., Midland, vice president for West Texas and New Mexico; Morris McDannald, Mac Drilling Co., Houston, vice president for the Gulf Coast. Front row: George P. Livermore, Livermore Drilling Co., Lubbock, Tex., national vice president; J. Zeppa, Delta Drilling Co., Tyler, president; J. U. Teague, Columbia Drilling Co., Houston, retiring president; Brad Mills, Dallas, retiring executive vice president; W. L. McClusky, M. J. Delaney Co., Dallas, secretary-treasurer.

Newly chosen officers not shown are: Ray Wiley, Ray Wiley Drilling Co., Carmi, Ill., vice president for cable tools; Frank G. McClintock, Zephyr Drilling Co., Tulsa, vice president for Central Mid-Continent area; F. M. Stevenson, Signal Drilling Co., Denver, vice president for Rocky Mountain region; William D. Tetsch, Terminal Drilling & Production Co., Los Angeles, vice president for California; E. F. Fullen, Mallard Well Service, Lafayette, La., vice president for well servicing; M. G. Rowe, Rowan Drilling Co., Inc., Fort Worth, vice president for North and West Central Texas; Marion S. Church, Dallas, general counsel.

## Who's getting the drilling contracts

**Trigg Drilling Co.,** Oklahoma City, has the contract on a projected 8,400-ft. wildcat Powel Briscoe, Inc., also of Oklahoma City, is putting down 6½ miles northwest of Woodward, in northwestern Woodward County, western Oklahoma. Location is at 1 Krouth, in 12-23n-22w.

**Barnwell Drilling Co., Inc.,** Shreveport, is drilling a 6,800-ft. Rodessa test for its own account at a wildcat location 2¾ miles northeast of Vixen, in northwestern Caldwell Parish, northeastern Louisiana. It is about 2 miles northwest of production at Vixen.

**R. I. Manning Co.,** Denver, is on a new Carter Oil Co. contract in Washakie County, in the Big Horn basin, northwestern Wyoming. It is a relatively shallow job (2,400 ft.) in the South Nowood area, about 18 miles northeast of Worland. Objective is the Tensleep formation. Nearest production (Permian-Phosphoria) is about 5 miles west in the Cottonwood Creek field.

**Power Rig Drilling Co.,** Lafayette, La., is keeping a rig busy in Sunray Mid-Continent Oil Co.'s development of the new West DeQuincy field, in southern Beauregard Parish, southwestern Louisiana. It has just finished a 10,249-ft. drilling job at Sunray's 4-B Lutcher-Moore, and has moved to a wildcat location east of the field, where it is scheduled for a 9,600-ft. well, No. 2-C.

**Frank Caraway Drilling Co.,** San Angelo, Tex., has contracted for a 5,000-ft. Ellenburger drilling job in Runnels County, in West-Central Texas. It is for Karl Hoblitzelle, of Dallas, whose location, in H&GN Survey, Section 21, is 2 miles southeast of Norton, in the west-central part of the county. It is 3 miles northwest of Motley field.

**Owen Drilling Co.,** Lafayette, La., will drill a 9,850-ft. exploratory test about 1½ miles east of Cheneyville field, in southeastern Rapides Parish, Central Louisiana. It is a joint venture of W. L. Stokes and J. P. Owens. Location is at 1 H. K. Bubenzer Farms, in 15-1s-2e.

**Green & Dreblow Drilling Co.,** Bakersfield, is getting down on an exploratory test it is drilling for Artnell Co. in the Vallecitos area of San Benito County, Central California. Artnell plans to take the hole to Domengine-Yokut section about 7,000 ft. Its well is carried as No. 5-5 Ashurst with location in 5-17-11.

**Casey & Montgomery,** Bakersville, Calif., is moving a large rig from Mountain View field, in Kern County, southern California, where it has been drilling for Norris Oil Co., to San Emidio Nose field, about 15 miles southwest, where it will put down a 12,500-ft. exploratory test for Bandini Exploration Co. The new operation, Bandini - Hamilton Dome - Johnson 88-32, is in 32-12n-21w.

**Rowan Drilling Co.,** Houston, will drill a deep well for Superior Oil Co. on the west side of Pecan Lake field, a multiple-pay gas-condensate producing area in the marshlands of southern Cameron Parish, southwestern Louisiana. It will be Superior 11-B Miami Corp. in 30-14s-3w. Permit is for a 14,000-ft. test.

**Bilbo-Redding Drilling Co.,** Houston, is drilling on a new contract operation 6 miles southeast of Mount Belvieu, in northwestern Chambers County, Texas Gulf Coast. It is Frio-Vicksburg test for Trice Production Co., whose location, at 1-B Williams, in the B. Winfree Survey, is about ½ mile southwest of South Cotton Lake field. Permit is for 8,600 ft.

**Crow Drilling & Producing Co.,** Shreveport, has a new deep-drilling contract in the Pistol Ridge area of southwestern Forrest County, South Mississippi. It is a Washita-Fredericksburg test for Robert O. Sigler, of Hattiesburg, Miss., at 1 Reid, in 7-1s-13w. Location is ½ mile from production. Projected depth is 11,000 ft.

**Deckard Drilling Co.,** Shreveport, has a rig working on a wildcat location about 2 miles south of Little Creek field, in northern Pike County, South Mississippi. Contract is for a 11,000-ft. test to the top of the Lower Cretaceous. Operators are Joe R. Scroggins, W. H. Flanagan, and W. R. Fairchild Construction Co. Location is listed as 1 Bryant Estate, in 14-4n-8e.

**Fred Wilson Drilling Co.** has the contract on another well Austral Oil Co. is starting to confirm its new gas-condensate discovery 2½ miles northwest of Sorrento field, in Ascension Parish, southeastern Louisiana. The new operation, 1 Knost et al., in 8-10s-4e, is 3,100 ft. southwest of Austral's discovery well, completed last month in a 9,975-ft. pay. Permit depth is 11,200 ft.

# Another successful use for BAKER Packers... parallel string installations

Baker Retainer Production Packer Product No. 415-D

## FEATURES

Holds any pressure from either above or below that is safe for the casing, even under temperatures in excess of 300°F.

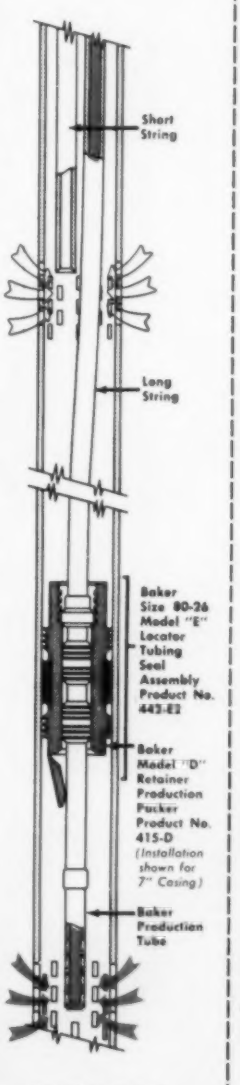
Pack-off is independent of set-down weight or tension. Tubing string is free; just pick up (or unlatch and pick up) to remove it.

Use it as a squeeze and testing tool or as a temporary or permanent bridge plug in conjunction with any production application.

**BAKER OIL TOOLS, INC.**
HOUSTON • LOS ANGELES • NEW YORK

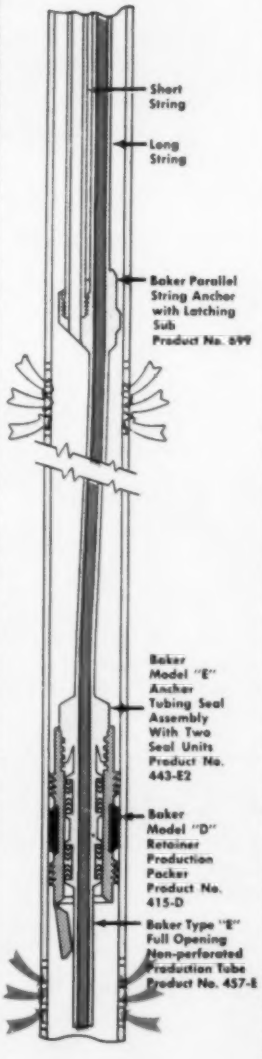
BAKER

### DUAL ZONE parallel string SHORT STRING HANGING FREE


Short String
Long String
Baker Size 80-26 Model "E" Locator Tubing Seal Assembly Product No. 443-E2
Baker Model "D" Retainer Production Packer Product No. 415-D (Installation shown for 7" Casing)
Baker Production Tube

Permits removal of either string independently of the other regardless of sequence. Full-Opening (Tubing I.D.) Long String to lower zone.

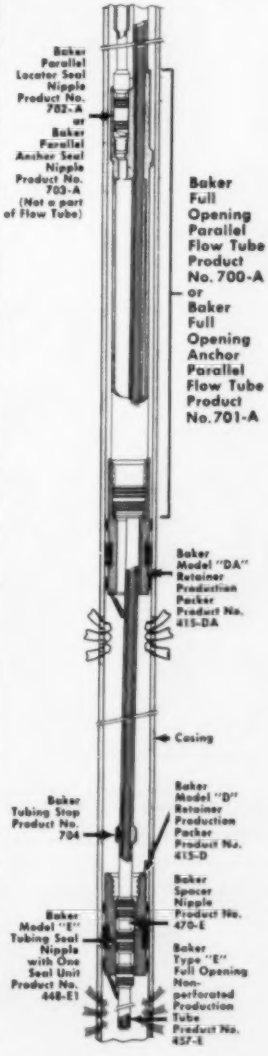
### DUAL ZONE parallel string SHORT STRING ANCHORED


Short String
Long String
Baker Parallel String Anchor with Latching Sub Product No. 599
Baker Model "E" Anchor Tubing Seal Assembly With Two Seal Units Product No. 443-E2
Baker Model "D" Retainer Production Packer Product No. 415-D
Baker Type "E" Full Opening Non-perforated Production Tube Product No. 457-E

Permits removal of either string independently of the other, however long string must be run first. Short string pulled first. Full-Opening (Tubing I.D.) Long String.

### DUAL ZONE parallel string TWO-PACKER HOOK-UP*

*Ask for details of "Retrievable Upper Packer" installations, and other parallel string hook-ups.


Baker Parallel Locator Seal Nipple Product No. 702-A or Baker Parallel Anchor Seal Nipple Product No. 703-A (Not a part of Flow Tube)
Baker Full Opening Parallel Flow Tube Product No. 700-A or Baker Full Opening Anchor Parallel Flow Tube Product No. 701-A
Baker Model "DA" Retainer Production Packer Product No. 415-DA
Casing
Baker Tubing Stop Product No. 704
Baker Model "D" Retainer Production Packer Product No. 415-D
Baker Spacer Nipple Product No. 470-E
Baker Model "E" Tubing Seal Nipple with One Seal Unit Product No. 448-E1
Baker Type "E" Full Opening Non-perforated Production Tube Product No. 457-E

Illustrates Two-Packer parallel string installation with each zone confined to its individual tubing string with full-opening to lower zone for use of all permanent-type completion tools.

## ▶ ▶ ▶ New Equipment Section

# This week's SHOWCASE features . . .

## Transistor-powered mobile radio

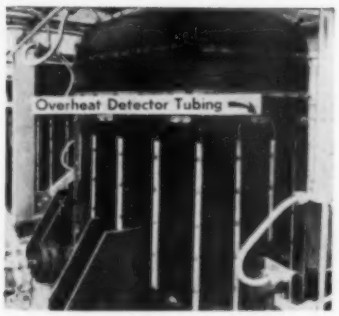
. . . contains power for both transmitter and receiver. Units are available either for mounting in the front of a car or truck, or for placement in a vehicle's trunk. They may be used in low-band frequencies (25-54 mc.), high-band (144-174 mc.), and UHF (450-470 mc.). **Write or call: Communication Products Dept., General Electric Co., Electronics Park, Syracuse, N. Y., for details on transistor radio.**

---

## New gage-hole cover

. . . for tanks assures tight sealing and does away with spherical machining on seat and cover. Stainless-steel facing is used on the base seat. The steel-plate cover has a flexible, leakproof, safety-seal ring which prevents vapor loss. The handle has been designed to offer quick opening by either hand or foot.

The cover, known as Figure 5008, is self-closing. The unit contains a tape-gage-marker point and a thermometer hook. The base is flanged steel, supplied for welding or drilled to match 150-lb. drilling. **Write or call: Mechanical Products Div., Shand & Jurs Co., 917 Carleton Street, Berkeley, Calif., for details on Figure 5008 gage-hole cover.**

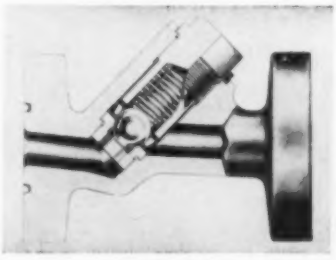



## Continuous-strip overheat detector

. . . sounds an alarm when a dangerous temperature is reached on equipment. The tubing is mounted to the equipment to be protected. When a predetermined temperature is reached, the resistance of the tubing's ceramic core drops. This permits a flow of electrical current between two wires imbedded in the core. The current, in turn, causes the alarm to sound.

In addition, continuous-strip detectors monitor the temperature along every inch of the strand. As such, the detectors pick up abnormal temperatures in large zones as well as in localized spots. **Write or call: Walter Kidde & Co., Inc., 675 Main Street, Belleville 9, N. J., for details on continuous-strip overheat detector.**

•



## Check valve rating is 10,000-psi.

. . . WOG, and it's designed for oilfield producing and gathering lines. Design features include combination metal-gasket and rubber O-ring seals to give tight bonnet and seat joints.

Also available is a stop valve with a 10,000-psi. WOG rating for oilfield use that employs the same sealing feature. Bodies of both valves are of drop - forged chromium - molybde-

---

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

**NAME AND/OR MODEL NUMBER**.....

.....

Described in **OIL AND GAS JOURNAL** - Issue of **October 27, 1958**

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

*The 175 ft. high Isobutane Fractionating Tower of The British Petroleum Company's new Alkylation Plant at Isle of Grain.*

# Britain's first alkylation plant goes on stream

The technician twists the valve that recently set Britain's first alkylation plant 'on stream'. This plant is part of The British Petroleum Company's Kent Refinery on the Isle of Grain. This BP Refinery now has the only complete unit for making Avgas in Britain. The new plant will produce 40 million gallons of Avgas a year.

BP

THE BRITISH PETROLEUM COMPANY LIMITED

num alloy steel. The seats and disks are of stainless-steel and Stellite. Both valves can be opened up for maintenance while in the line. And they're both available with screwed or socket-welding ends in sizes from ¼ to 2 in. API standard flanged-end models are available in a 2-in. size. **Write or call: Edward Valves, Inc., 1201 West 145th Street, East Chicago, Ind., for details on 10,000-psi. stop and check valves.**

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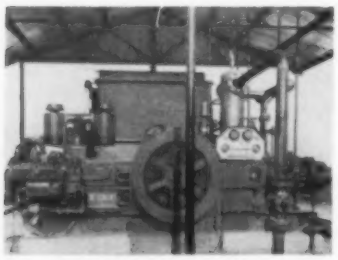

## Integral engine compressor

. . . for gas gathering, gas lifting, and secondary recovery has been developed. Tagged DPC-230, the gas-engine compressor is a horizontal, opposed-cylinder type.

Compressor features include a four-throw crankshaft mounted on three double-row, tapered roller main bearings which have engine throws of greater length than those on the compressor side. This permits piston speeds for optimum efficiency of the compressor while getting maximum power and fuel-economy from the power side, the maker says.

The complete unit, excepting the cooler, is mounted on a single rugged, skid-type base. **Write or call: Ajax Iron Works, Corry, Penn., for details on DPC-230 gas compressor.**

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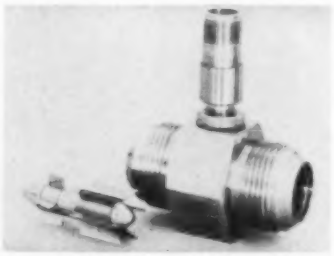

## Fluid-bearing flow sensor

. . . determines fluid velocity in a constant-area passage containing a spinning turbine rotor aided only by a fluid film which serves as a bearing.

Since the rotor floats entirely on the fluid film, wear and error effects from either the radial or thrust friction are overcome. Ranges of 10 to 1 can be obtained with an accuracy of ¼% of the actual flow rate.

Maximum flow limit is determined by the acceptable pressure drop. The unit can't be damaged by continuous overranging up to several times the nominal limit, the maker reports. **Write or call: Waugh Engineering Co., 7842 Burnet Avenue, Van Nuys, Calif., for details on fluid-bearing flow sensor.**

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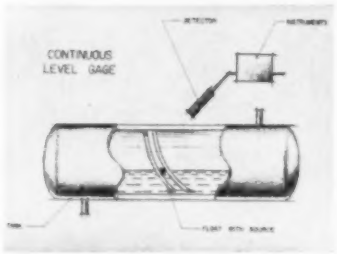


## Liquid-level-gage accuracy high

. . . in measuring the level of liquids in totally enclosed containers of any size and dimensions. Level measurement is accurate to a few hundredths of an inch, the maker claims. Continuous readings are provided in depth or volume.

A small radioactive source in a


# L-P GAS TESTING EQUIPMENT

*Tests . . .*

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VAPOR PRESSURE BOMB

Designed for NGAA Standard No. 2140 requirements. Used for the determination of the gauge vapor pressure of liquified petroleum gas products. This apparatus consists of a bomb having two sections, or chambers. An upper 80% capacity chamber and a lower 20% capacity chamber. A bleeder valve, inlet valve, and chamber separating valve are included. Bomb and gauge connections use "O" ring seals permitting hand tightening. Each bomb tested to 500 psi. Range 0-300 lbs.

CORROSION TEST BOMB

Tests the corrosiveness of LP gases. An all stainless steel bomb for corrosion tests by the copper strip method. Sealed by a neoprene "O" ring which makes it possible to make the bomb pressure tight with the hands and without wrenches. Complete with two nickel plated valves, connecting hose with swivel connections, adapter to ¼-inch pipe.

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# FOR HIGHER PUMP EFFICIENCY IN GASSY OR FOAMY WELLS

# specify

# oilmaster

## RATIO-COMPOUND PUMPS

...designed to eliminate gas lock and improve pump efficiency in wells where a high percentage of gas must be produced along with the well fluid.

When a conventional pump becomes loaded with gas, a gas lock frequently results, and high static pressure on the traveling valve makes this gas lock difficult to break. In the Ratio-Compound Pump, this high static pressure is carried by the top traveling valve, and during the downstroke the second stage pulls a suction on top while the first stage applies pressure below the intermediate traveling valve. Therefore, it opens promptly at the beginning of the downstroke even if the pump is filled with foam or gas. The improved valve action eliminates gas lock and improves pump efficiency.

A bonus feature of the novel two-stage design is the absence of gas or fluid pound in the low efficiency range. Static pressure acts on the hollow polished rod when the top traveling valve is closed and actually pulls a tension in the rod string during the downstroke, resulting in improved plunger travel, decreased load range on the rods, reduced torque on the unit gear box, and lowered horsepower requirements on the prime mover.

If you have the problem of pumping foamy or gassy oil, call your Oilmaster representative and ask him about the Ratio-Compound, or write Fluid Packed Pump Co., Box 64, Los Nietos, California for literature.

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FLUID PACKED PUMP CO.

*Main Office and Plant, Los Nietos, California.*

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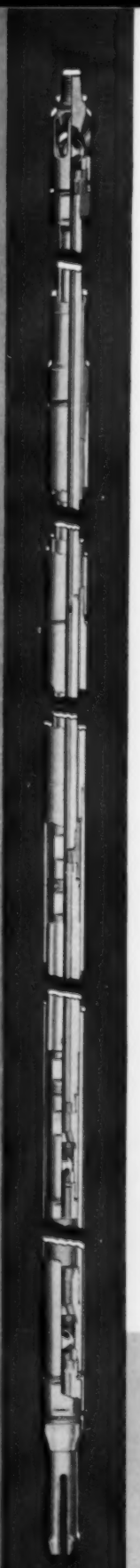
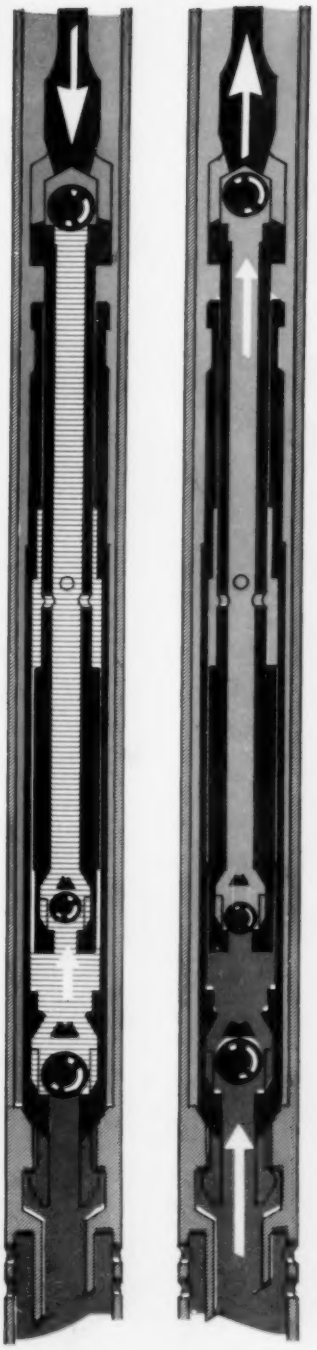
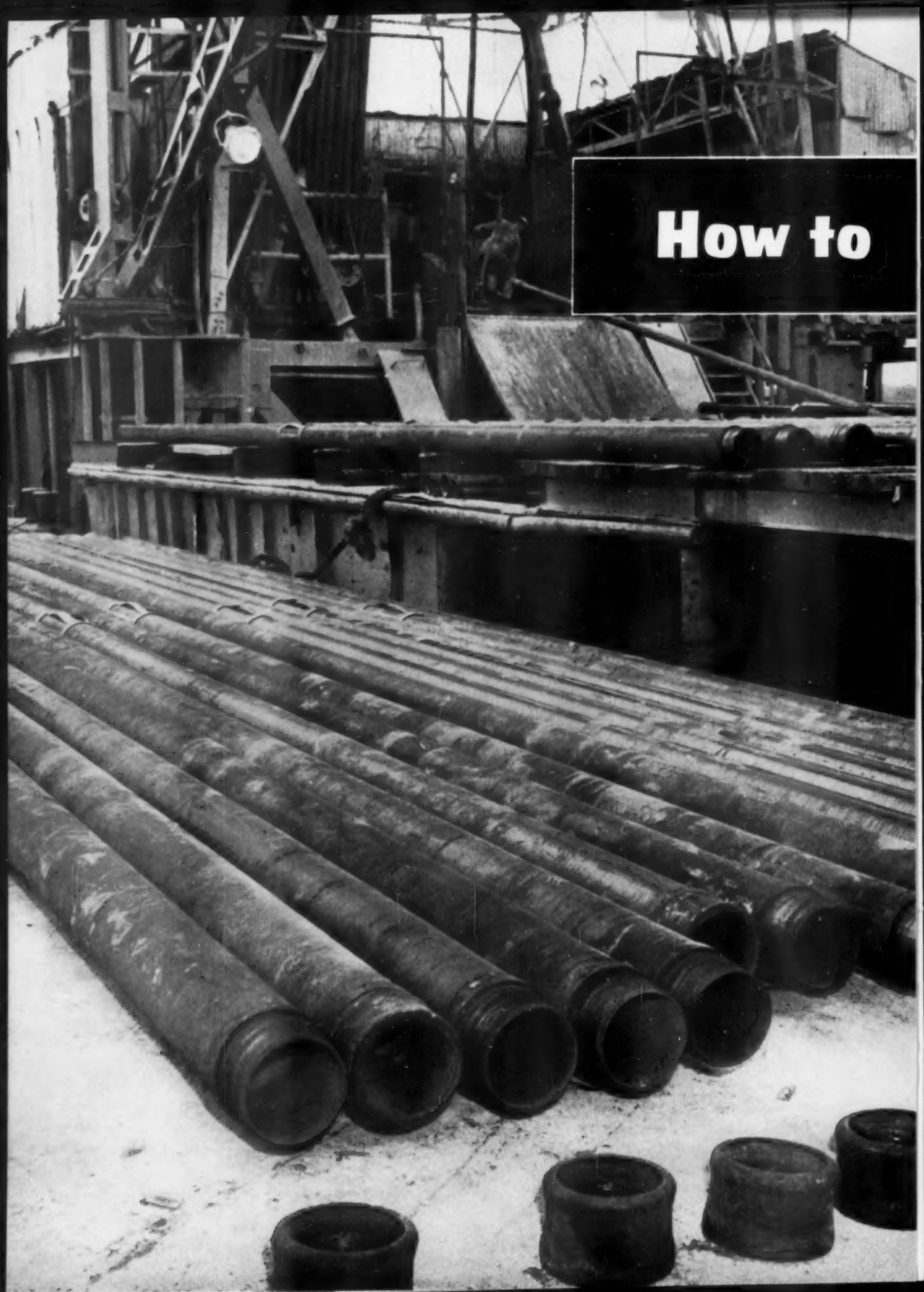




On the upstroke, fluid and gas enter the pump through the standing valve into the full area of the barrel underneath the plunger. This is the first stage chamber. At the beginning of the downstroke, the top traveling valve closes, the gas is compressed and the fluid is displaced into the second stage chamber which is the annular area between the hollow polished rod and the barrel above the plunger. On the subsequent upstroke the top traveling valve opens and the annular chamber discharges the fluid and compressed gas into the tubing.


How to

# Case With Confidence

**J&L Extreme Line Casing** lets you case your deeper wells with confidence. Extreme Line is the one casing designed for use under the most severe and variable conditions.

Extreme Line features include high joint strength, positive resistance to leakage, reduced outside diameter and elimination of couplings. Faster running speeds result from modern thread and joint design. External streamlining and high resistance to thread damage add to the qualities of this proven product.

**J&L Extreme Line** is available in grades J-55, N-80 and P-110. Quality controlled manufacturing of all J&L tubular products is your assurance of superior performance.

Be sure you have the latest information on **J&L Extreme Line Casing,** which is manufactured under license from The National Supply Company.

Call your local Jones & Laughlin Supply Division store or office.

**Jones & Laughlin**
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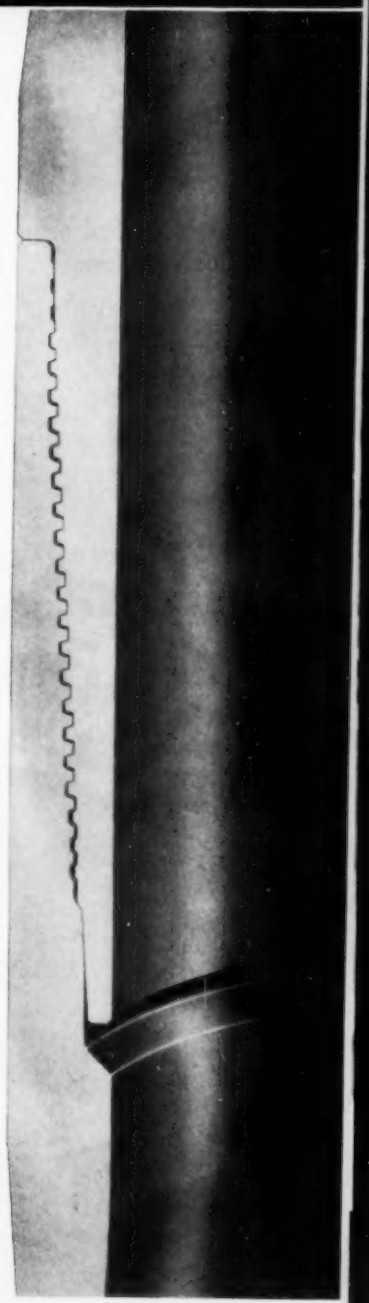
If it's sold by J&L....
It's the best available





Extreme Line Joint

SHOWCASE . . .

# New Equipment

float follows the liquid level along guide lines inside the tank. A scintillation detector outside the tank detects radiation emitted. Level changes cause changes in radioactivity strength. This change is calibrated either in distance or volume.

Potential uses for the model 40104 gage include determination of amount of natural gas in underground storage cavities as the gage can measure the level of water pumped into the cavity to force out the gas. **Write or call: Radiation Counter Laboratories, Inc., 5121 West Grove, Skokie, Ill., for details on Model 40104 liquid-gage.**

•

## Water-cooled engine driven welder

. . . comes in 300 and 400-amp. sizes and is particularly suited for pipeline construction, the maker reports. Features of the Yellow Jacket welder include high recovery voltage designed to eliminate "popouts" with any size and type of electrode. Current peaks are controlled to give good penetration without burn-throughs.

Load dropoff is minimized to achieve a steady, even current and quick arc response. **Write or call: Air Reduction Sales Co., 150 East Forty-second Street, New York 17, for details on Yellow Jacket welders.**

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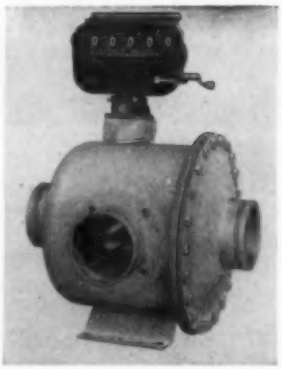

## New high-capacity meter

. . . designed for mobile service has a working pressure of 150 psi. Known as the Brodie BiRotor meter Model B-80C, it has a 750-g.p.m. positive displacement.

The B-80C can be used on tank trucks, trailers, and hydrant metering carts. Outlets are provided both front and rear, permitting virtually any piping arrangement. The unit may be equipped with various types of Brodie counters, printing counters, and the Brodie Shockfree Quantrol to deliver present gallonage. Meter and counter are reversible to handle both fueling and defueling. **Write or call: Ralph N. Brodie Co., Alvarado and West 137th Avenue, San Leandro, Calif., for details on B-80C meter.**

•

## Emergency pipe clamp installs easily

. . . through use of a slotted lug. The clamp uses only one bolt and is only 2⅞ in. wide. Called the Junior and made of malleable iron, it has a full-

Make titrations a routine function for lab assistants! Cenco's new Color • Matic Endpoint Detector and Volumatic Syringe enable quick, successive determinations — just *push a button and read a number.* Eliminates human element and drainage errors. Precise to within a few parts per thousand. Write for Bulletin 285.

*No. 20925 Color • Matic Endpoint Detector* . . . . . $395.00
*No. 20926 Volumatic Syringe* . . . . . $295.00

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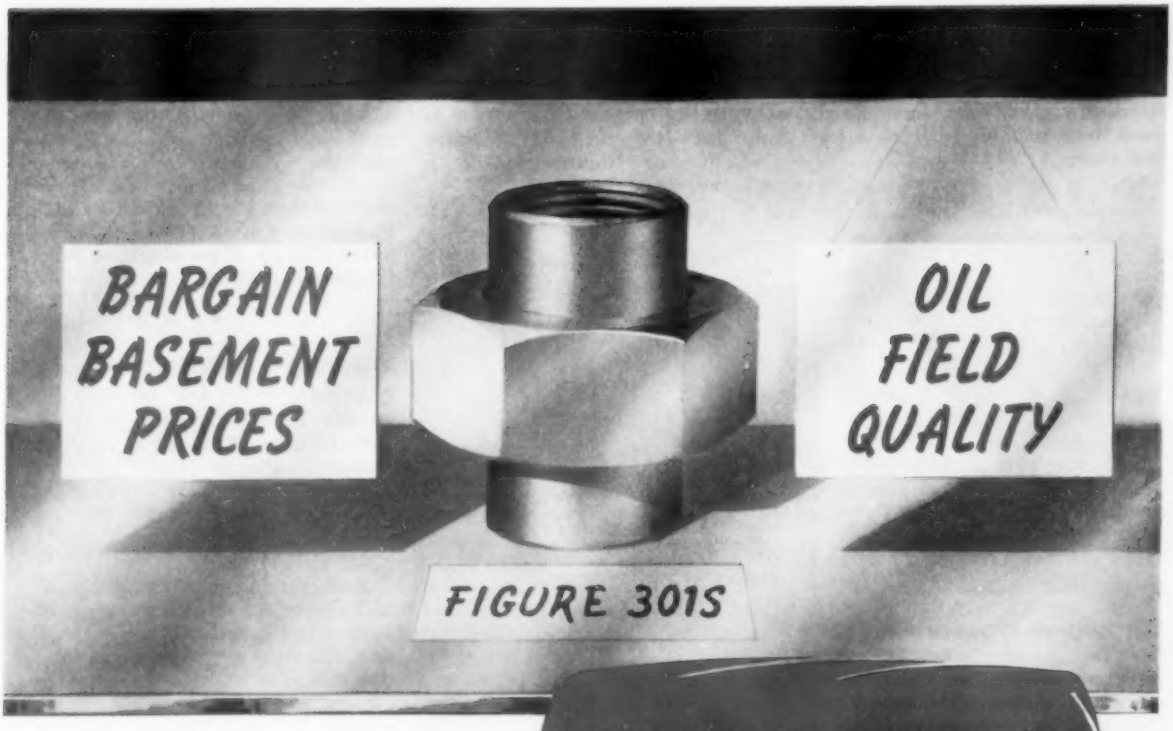


Yes, here's the greatest bargain you'll ever find in unions: The Figure 301S . . . built to take oil field service—priced to fit the most modest budget.

Featuring the time-proved flat-face design with O-Ring seal, Figure 301S Unions retain all of the ruggedness and dependability you've become accustomed to in other Yale Machine Works unions. Yet, because of quantity production from new, high speed machines, prices are lower than ever seemed possible for unions of this quality. For example, a Figure 301S, ¼", 1000 psi cold working pressure union sells for only $2.70; a 2", 3000 psi cwp, for only $9.50! And for only a few cents extra, you can have the permanent rust protection of cadmium-plating.

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R. S. Stokvis & Sons, Inc.—New York

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length hinge along one side and the oversized plated bolt on the other.

Available clamp sizes are to be 2, 2½, and 3 in. **Write or call: M. B. Skinner Co., 3502 West Sample Street, South Bend, Ind., for details on Junior pipe clamp.**

•

## Suspension-type drilling tool

. . . offers a number of advantages for deep drilling, according to the maker. It eliminates bounce in the drill pipe and reduces vibration on the rotary and swivel by hydraulic action of the drilling fluid as it passes through a differential chamber between the suspension tool body and stem which acts as a shock absorber to cushion the drilling.

The tool is used between drill collars. It is available in drill-collar sizes of 3½ through 11 in. **Write or call: Beck-Hill, Inc., 829 Houston Club Building, Houston, for details on suspension drilling tool.**

•

## Hose maintenance and repair kit

. . . contains an assortment of 45 clamps—including both preformed and open-end types—and a tool for tensioning and locking the clamps. There are no bolts or other projections to catch or snag once the clamp is applied. Called the K-45 Clamp-Master Kit, it comes in a red, all-steel carrying case.

The kit is intended primarily for use in making hose connections and repairs. However, the kit also offers a simple method for clamping, tying, mending, and banding tool handles, rope ends, cable, conduit, and pipe insulation. The range of clamp sizes is suited for objects which have diameters from ½ to 10 in. **Write or call: Punch-Lok Co., 321 North Justine Street, Chicago 7, for details on K-45 Clamp-Master Kit.**

•

## Pneumatic temperature control

. . . also serves as a recorder or an indicator as it actuates an air-operated throttling valve to control the flow of steam, water, or gas or to actuate other air-operated devices. The recording control, Model RVA, has a 12-in. circular chart.

Both controls are explosionproof and can be installed in any type of hazardous location. They give accurate and sensitive-proportioning-valve operation. The models are available in 10 optional temperature ranges between −30 and 1,100° F. **Write or call: Partlow Corp., 2 Campion Road, New Hartford, N. Y., for details on temperature control Models RVA and IVA.**

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THE OIL AND GAS JOURNAL

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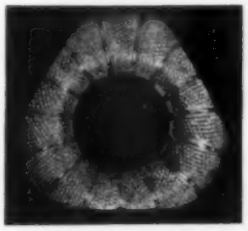

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# New Literature

## Single-range hand tachometer

. . . that's specially designed for speed measurement with an accuracy of ±0.25% of the full-scale deflection is described in new 20-page Bulletin 35-91. It's designed for laboratories, test beds, and in quality control or production tests. The dial diameter is 120 mm. Scale calibration is open and easily readable. The drive shaft is equipped with ball bearings. The tachometer is supplied with two large, rubber-mounted male and female centers, and extension shaft and center, oil container, and dropper. **Write or call: James G. Biddle Co., 1316 Arch Street, Philadelphia 7, for Bulletin 35-91.**

## Heavy-duty floor finishing

. . . and resurfacing are discussed in new eight-page Bulletin 653. The bulletin gives specifications for preparing base slabs, mixing Cortland emery and cement, and placing Emeri-Crete mix for monolithic and granolithic finishes. How to prepare old concrete floors for resurfacing or patching is explained. Information on curing and protecting new or refinished surfaces is included. Estimating data and tool and material requirements are also given. **Write or call: Walter Maguire Co., Inc., 60 East Forty-second street, New York, for Bulletin 653.**

## Insert-plastic Dall flow tube

. . . that's lightweight and corrosion-resistant is detailed in new four-page Bulletin 115-RI. The bulletin includes photographs, dimensional and cost-comparison tables, cutaway views, and performance charts in addition to the explanatory text. The Model DFT-PI is made of reinforced glass-fiber expoxy or polyester resins with metallic throat lining. It's available in a variety of sizes and flange and throat materials. **Write or call: Builders-Providence, Inc., 345 Harris Avenue, Providence 9, R. I., for Bulletin 115-RI.**

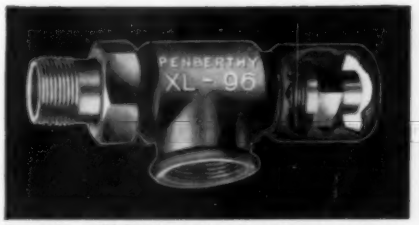
## Barometric condensers

. . . for removing air and exhaust steam and other vapors from vacuum equipment are described in new 12-page Bulletin 5AA. The bulletin covers condenser theory, design features, construction, operation, and application. The types described include: multijet; multijet spray; multi-

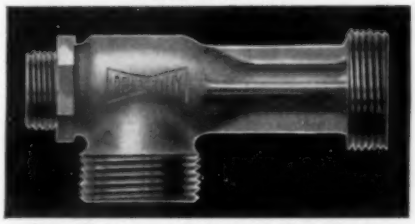

*Simplify handling of*

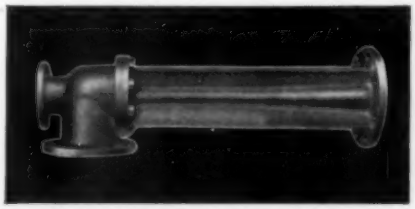
*fluids, vapors, gases . . .*

**and "HOT" MATERIALS**



Series 1A and 20A Ejectors perform efficiently over a wide range of operating conditions.


Series 60A fluid operated jet pump for lifting, elevating and blending liquids or slurries.


Special jet pump for handling corrosive chemicals. Stainless steel with flanged connections.

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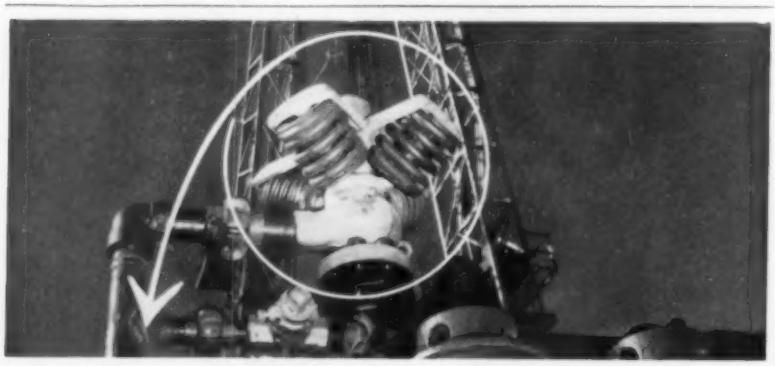

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spray; and countercurrent. Performance data is included in easy-to-read curve form with examples. Tables give sizes, dimensions, and weights for all of the units described. **Write or call: Schutte & Koerting Co., Cornwells Heights, Bucks County, Pa., for Bulletin 5AA.**

## Cooling-tower deterioration

. . . can be lessened by recognizing destructive elements in advance, and a new eight-page brochure tells you what to look for. The bulletin lists the causes of lumber deterioration and describes the "attack" processes. Representative samples of deteriorated lumber help illustrate some of the more common safety hazards. **Write or call: Hudson Engineering Corp., Fairview Station, Houston, for Wood Deterioration in Cooling Towers Bulletin.**

## Close-fitting seal

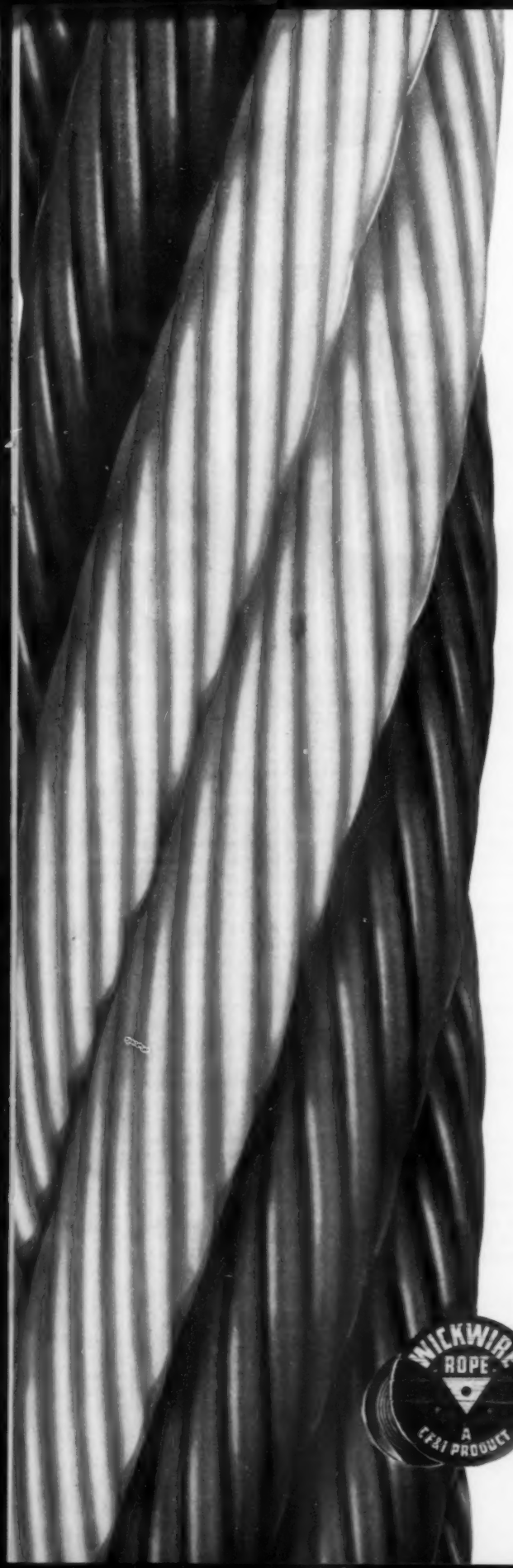
. . . for floating-roof tanks is described in a new four-page folder. Horton fabric seal is a tough, long-lasting fabric that conforms closely to local shell irregularities and tank out-of-roundness, the maker claims. Diagrams of the seal in use and a performance checklist are included in the folder. **Write or call: Chicago Bridge & Iron Co., 332 South Michigan Avenue, Chicago 4, for Horton Fabric Seal Bulletin.**

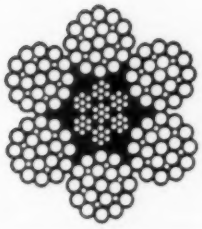
## Handbook on demineralizing

. . . is the title of a new 40-page booklet now available. It compares various methods of water treatment, as well as pointing out the comparison between demineralizers and evaporators. The handbook goes into the characteristics of the various types of available cation and anion exchange materials. It offers data on operting costs of demineralizing. Included is information on when to use two-bed, three-bed, four-bed, mixed, or monobed demineralizers. It also indicates when decarbonators or vacuum deaerators are required. The bulletin is complete with typical flow diagrams, photos, and the chemical results obtained with demineralization. **Write or call: Cochrane Corp., 3107 North Seventeenth Street, Philadelphia 32, for Publication 5800.**

## Recorder-controller-indicator

. . . is described in new two-page Bulletin RF-588. The compact, probe-type unit is said to be a significant advance in process instrumentation for accurate level-measurement and control. Known as Series 42, the recorder-controller-indicator is already in widespread use for level-measurement and





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6401

*LOOK FOR THE YELLOW TRIANGLE*

# Does the effectiveness of an antioxidant eventually decrease?

*Du Pont's Bill Robinson answers an oil man's questions about antioxidants*

**Q. Does the effectiveness of an antioxidant eventually decrease?**

A. Over a period of time the concentration of antioxidant gradually decreases as it does its job of stabilizing the gasoline. Eventually the antioxidant will be completely used up if the gasoline is stored for long periods.

**Q. Then how can the antioxidant be of value?**

A. Antioxidants function in fresh gasolines by terminating chain-forming initiators that lead to gum formation. When the antioxidant is completely consumed, gum formation can continue, but normally gasoline is used long before the antioxidant is depleted.

**Q. How much antioxidant is required to do a good job?**

A. This depends upon the gasoline type and the length and severity of storage to which it will be subjected. Antioxidants are effective in very small quantities and usually 4 to 8 pounds per 1000 barrels are adequate. Economy is the reason antioxidants are preferred for eliminating potential gum problems.

**Q. How can a refiner tell how much antioxidant he requires?**

A. The best procedure is to evaluate the gasoline in 110°F. storage and to establish a correlation between the 110°F. storage and an accelerated test. Accelerated tests by themselves are frequently unreliable, but a useful rule of thumb used by many of the refineries is that the gasoline should have at least a 150-minute increase in induction period due to the addition of an inhibitor.

**Q. Can antioxidants overcome the catalytic effect of copper?**

A. Not completely, although for practical purposes high dosages of antioxidant will minimize those detrimental effects. This is uneconomical, and the use of Du Pont Metal Deactivator is the preferred treatment to overcome copper contamination of fuels.

**Q. Are antioxidants preferred over chemical processes for producing stable gasolines?**

A. For most gasolines the answer is yes.

**Q. Why?**

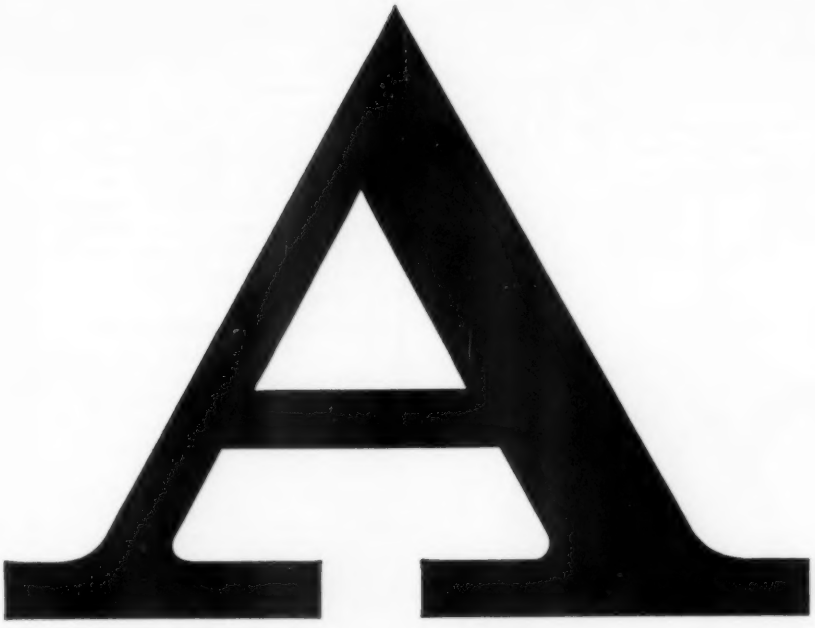
A. It comes right down to dollars and cents. Antioxidants are less expensive because no expensive equipment or product loss is involved. Antioxidants also provide an "insurance value" to products after they leave the refinery. The antioxidant continues to work even after the gasoline passes beyond the refiner's control.

**Q. Can chemical treating and antioxidants be combined?**

A. Antioxidants are frequently used to supplement caustic washing and also have been used after more drastic chemical treating procedures.

**Q. What are the main classes of antioxidants used in motor gasoline?**

**WILLIAM T. ROBINSON** is head of the Du Pont Petroleum Laboratory's Product Application and Service Division. In this capacity, he supervises technical work on gasoline and fuel oil additives. "Bill" and his associates work closely with refiners on problems concerning the effective use of petroleum additives.



A. There are three that are widely used. These are the phenylenediamine type, such as Du Pont Antioxidant 22; the aminophenol type, such as Antioxidant 5; and the alkylated phenols such as Antioxidant 29. All three classes are potent antioxidants.

**Q. Why does Du Pont market three different antioxidants?**

A. This is in line with the Du Pont policy of supplying a complete line of additives for petroleum products. All of these antioxidants are excellent and any one may show up to advantage in a particular stock.

**Q. What are the advantages, for example, of Antioxidant 22?**

A. Antioxidant 22 is approved for use in aviation gasolines and may be used before a caustic wash and over strongly alkaline tank bottoms. Since it is 100% active ingredient it requires less handling and may be used for antioxidant sweetening of low mercaptan stocks.

**Q. Which stocks are best suited for Antioxidant 22 sweetening?**

A. It is generally considered that full boiling range, catalytically cracked gasolines, and blends of catalytically cracked and straight-run gasolines, are best suited for antioxidant sweetening. Many other stocks have been successfully antioxidant sweetened, but because of the moderate mercaptan sulfur concentrations, the presence of olefins, etc., Antioxidant 22 sweetening is almost universally applicable to cat-cracked gasolines.

**Q. If Antioxidant 22 is used for sweetening, are any of its antioxidant benefits lost?**

A. Studies have indicated that there is a slight loss of antioxidant, but it is quite small if the system is controlled carefully.

**Q. What is the maximum mercaptan sulfur content that can be sweetened with Du Pont Antioxidant 22?**

A. This varies according to the stock. There have been several cases of high mercaptan sulfur content stocks being successfully sweetened. However, as a rule of thumb, Antioxidant 22 sweetening should not be applied to stocks having more than 0.01 weight per cent mercaptan sulfur unless the sweetening system is carefully controlled.

**Q. In the sweetening process, how early should Antioxidant 22 be added?**

A. Generally, Antioxidant 22 should be added as soon as possible after $H_2S$ and thiophenols have been removed by caustic washing. This early addition permits effective mixing and allows more time for the sweetening reaction.

**Q. Do antioxidants increase intake system deposits?**

A. No, in practical use concentration antioxidants have a beneficial rather than a detrimental effect because they prevent formation of gum which could contribute to intake system deposits.

**FOR FURTHER INFORMATION on antioxidants, call in your Du Pont representative or write Petroleum Chemicals Division, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Del.**

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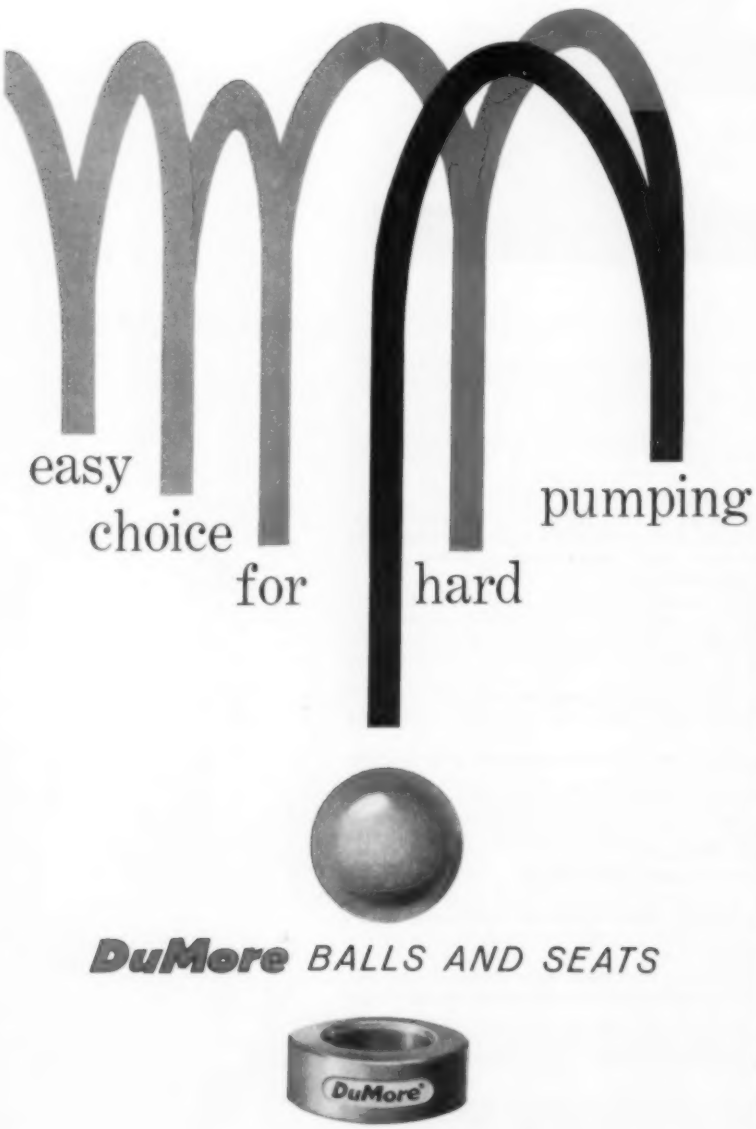


control in process industries. It is also employed in many gaging operations. Electrical or pneumatic-control forms can be incorporated in a single housing. The unit operates with either conductive or nonconductive materials. It is available in an explosionproof housing for applicable classifications. **Write or call: Aeronautical & Instrument Div., Robertshaw-Fulton Controls Co., 401 North Manchester, Anaheim, Calif., for Bulletin RF-588.**

## Gas-turbine compressors

. . . which permit reduced process-operating costs are described in a new multicolored 12-page catalog. The turbine is designed to expand waste process gases at temperatures up to 1,250° F. The turbine-driven compressor delivers air to the process at pressures ranging from 30 to 200 psig. The catalog also provides charts of specifications, weights, dimensions, and nozzle sizes. **Write or call: Elliott Co., Jeannette, Penn., for Power Recovery for Your Process Catalog.**

## Short-tension packer

. . . is covered in a new four-page bulletin. It's a short and low-cost packer designed for use in water flooding, acidizing, fracturing, and other below-packer pressure applications. The bulletin includes an illustration of the packer, an outline of uses and construction features, complete engineering data, parts list, and instructions on redressing procedure. Also included are setting and pulling procedures with a table of surface-setting strokes necessary to obtain desired tension load on the packer. **Write or call: Guiberson Corp., P. O. Box 1106, Dallas, for Short-Tension Packer Bulletin.**

## Mobile drilling rigs

. . . that are wheel-mounted are featured in new four-page Bulletin DRB-5H. Known as Dual Rambler rigs, they feature big-rig capacity with small-rig mobility. All major parts are mounted on two semitrailers. They are joined at the well-site into a complete self-contained rig. The drawworks trailer is designed to carry hoists up to 750 hp., with compound, power units, and accessories. The mast trailer is designed for internally guyed telescoping masts in the 95 to 105-ft. range. The mast trailer also carries the substructure and traveling components. A pipe-ramp walk is integral with the trailer. Specifications, drawings, and photos of various models of the Dual Rambler rig are included. **Write or call: Ideco, Inc., P. O. Box 1331, Dallas, for Bulletin DRB-5H.**

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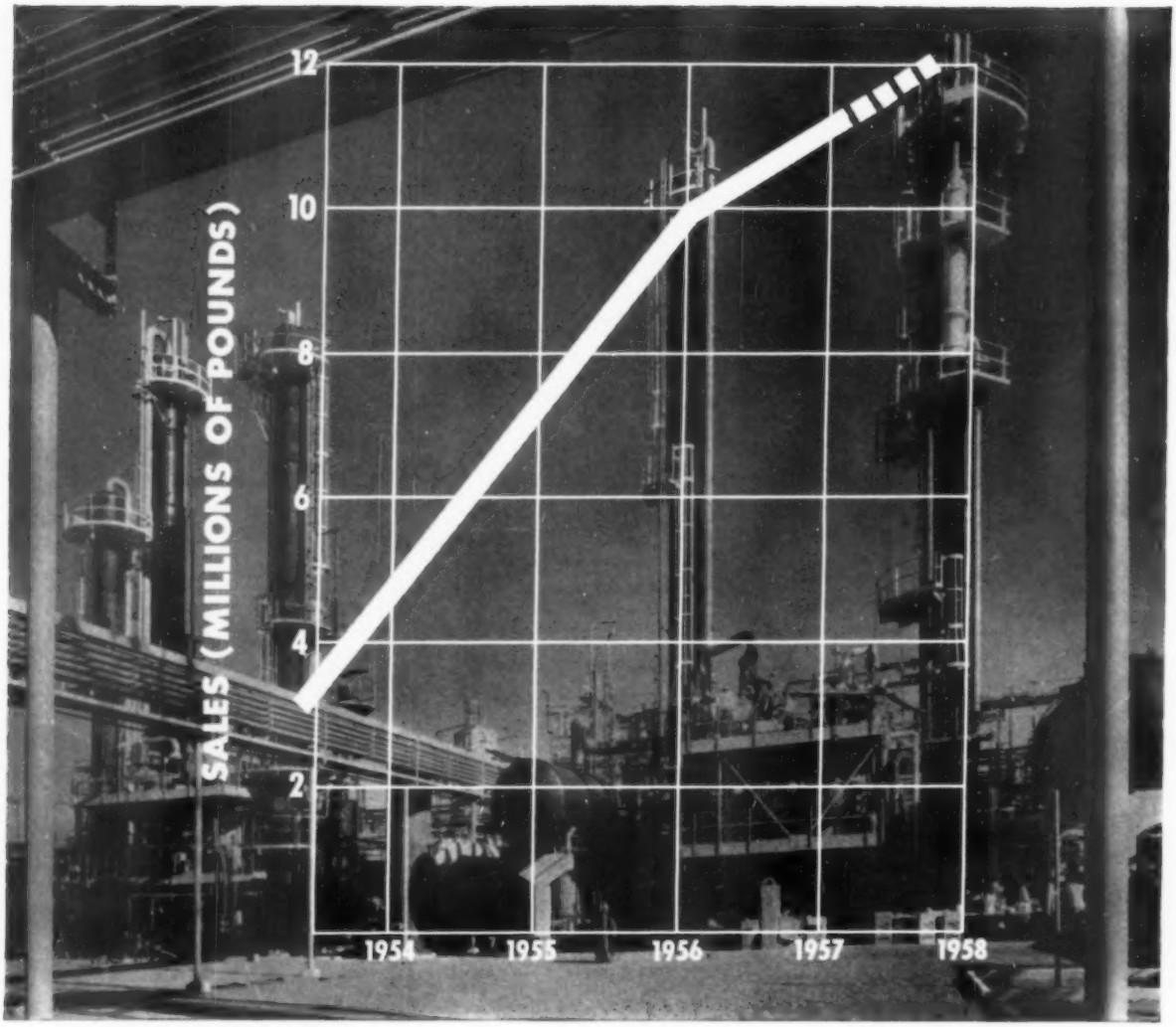



# GOVERNMENT FIGURES PROVE AMAZING GROWTH OF DALPAC-TYPE ANTIOXIDANTS

Figures of the U. S. Tariff Commission show the astounding growth of di-tert-butyl-p-cresol in just three years—almost tripled!

Dalpac 4, Hercules di-tert-butyl-p-cresol, has firmly established itself as a leading antioxidant in many industries where hydrocarbon stability is a problem. Petroleum refiners, for example, rely on Dalpac to inhibit gum formation, stabilize gasoline color and prevent engine deposits. They use it in turbine and transformer oils to prevent deterioration. Dalpac 4 has no effect upon electrical properties, which makes it ideal for use in transformer oils.

These are but a few indications of where this Hercules antioxidant can serve you. Since Hercules is a basic integrated producer starting with the raw material, you can count on a dependable source of supply. We will be glad to answer your inquiries and send technical information.

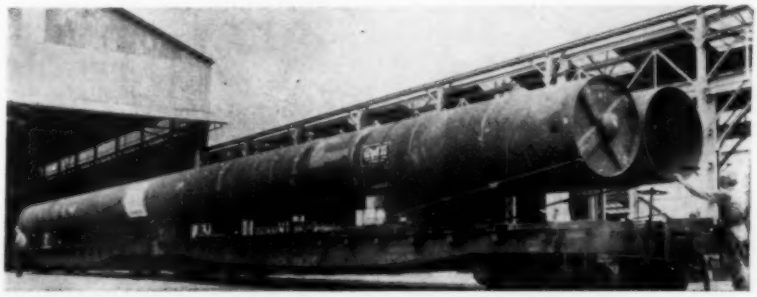
**DALPAC® 4**

*Oxychemicals Division • Naval Stores Department*
*HERCULES POWDER COMPANY*
*900 Market Street, Wilmington 99, Delaware*

## Girdler catalysts office opens

M. R. Likins

. . . in Houston, according to an announcement by the chemical products division of Chemetron Corp. Walter H. Girdler, Jr., division president, stated that the new office will be under the direction of Merle R. Likins. This facility is designed to assist users of Girdler specialty catalysts in chemical, petroleum, and other types of processing plants in Texas, Oklahoma, Louisiana, Arkansas, and Mississippi.



**These mooring posts were fabricated in Houston plant**

**. . . of Wyatt Metal & Boiler Works, Inc., as part of the expansion of San Lorenzo terminal of Compania Shell de Venezuela, Lake Maracaibo. The facilities were designed and constructed by Brown & Root S.A. of Venezuela and will be used by San Jacinto Venezolano, C.A., subsidiary of San Jacinto Petroleum Corp. Each post is made from high tensile steel and is 110 ft. long and 54 in. in diameter. The posts were driven 65 ft. into the lake bed with water 35 ft. deep, leaving 10 ft. exposed.**

## Oil Well Supply Division names

D. O. Smith

. . . D. O. Smith as area manager, tubular sales, at Houston; G. L. Heidler as area manager, refinery and pipeline equipment sales, at Houston; and H. C. Nicholson as manager of the Corpus Christi, Tex., store, according to M. F. Jones, Gulf Coast area manager. Also announced is the transfer of W. L. Reed, district engineer, from Houston to Jackson, Miss. Smith succeeds R. F. Cann, recently retired. Smith joined Oilwell in 1924. Heidler and Nicholson joined the division in 1946; and Reed in 1948.

## Dowell transfers five

. . . to Sterling, Colo., according to an announcement from Dowell division of The Dow Chemical Co. C. L. Brain and W. F. Hays have been transferred from Borger, Tex. S. S. Middleton moved from Jacksonville, Fla.; G. W. Nairn from Great Bend, Kans.; and Paul Swift from Tulsa. Brain will engage in industrial sales work. Hays will represent Dowell as a service engineer in the oil field division. Middleton will continue as an equipment operator in the industrial division, as will Nairn. Swift will head up the oil field work at Sterling. Also announced is the transfer of Warren Sallee from New Orleans to the district office in Denver, according to E. J. Davis, district manager.

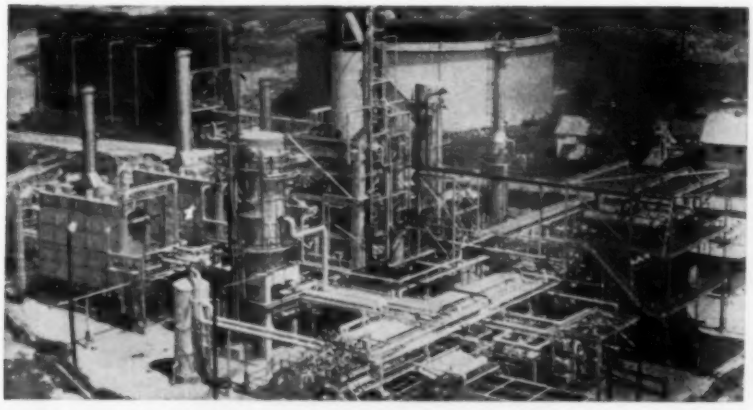
## Shearin, Schultz appointed

. . . to assistant manager in charge of domestic studies and assistant manager in charge of foreign studies, respectively, according to W. L. Horner,

H. M. Shearin

W. P. Schultz

manager of Core Laboratories, Inc.'s, engineering and consulting operations. H. M. Shearin and W. P. Schultz are both former employes of Humble Oil & Refining Co.



## Crude unit awaits 12-mile move to Cushing, Okla.

**This modern 14,000 barrel-a-day vacuum crude unit, built in 1952 at the now defunct Tidewater Oil Co. refinery at Drumright, Okla., has been sold to Kerr-McGee Oil Industries, Inc., and is awaiting transplanting to the Kermac refinery at Cushing. The refinery is being liquidated under contract by Heat & Power Co., Inc.**

## Claude L. Griffin appointed

C. L. Griffin

. . . sales manager, United States and Canada, according to John C. Helies, executive vice president and general sales manager, Security Engineering Division. Griffin has been active in the oil industry since 1933. Most recently he was vice president of American Iron & Machine Works Co., in charge of international sales.

## Three new salesmen appointed

. . . reports J. R. Carlson, sales manager of Jefferson Chemical Co., Inc. R. E. Lee and P. W. Loftus will report to the company's Chicago office. E. F. Benson will report to the New York

office. Lee was formerly employed by The Upjohn Co. Loftus and Benson both were formerly with The Dow Chemical Co.

### G. Barney Blair appointed

. . . as manufacturer's representative for Kelco products in East Texas, North Louisiana, southern Arkansas, and Mississippi, according to an announcement from Ben F. Kelley Co., Inc. Barney has spent 22 years in oilfield supplies with Mid-Continent Supply Co. and National Supply Co.

### Richard G. Jones named

R. G. Jones

. . . as sales representative for the South Texas area, according to Clyde M. Lackey, domestic sales manager, Cardwell Manufacturing Co. Jones comes to Cardwell with 10 years oilfield experience, the last 4 years being with Baroid Division, National Lead Co.

### West Coast shipyard expands

**. . . to strengthen its position in construction of offshore drilling platforms for use in California's coastal waters. National Steel & Shipbuilding Co., San Diego, already has a jump on other West Coast yards, having built and recently delivered this permanent type platform, the only one of its kind in West Coast waters, to Standard Oil Co. of California. It is now in service 2 miles off Summerland, Calif.**

**A total of $1.5 million will be expended to improve and enlarge facilities at Nassco's San Diego shipyard. Although the firm's founding dates back to 1905 as an iron foundry and machine shop, it wasn't until 1945 that it got into the shipbuilding phase of the industry. Between 1950 and 1954 Nassco was on a wartime footing and delivered 126 vessels to the military services, ranging from minesweepers to harbor tugs.**

### Swartwout Co. gets contract

. . . in excess of $200,000 to furnish the entire control equipment requirements for Esso Standard Oil Co.'s refinery at Rotterdam, Holland. The new 100,000 bbl. facility will use over 1,100 separate pieces of Swartwout Autronic equipment. The refinery was engineered by Esso Research & Engineering Co.

### Blaw-Knox Co. appoints

. . . George F. Kline as manager of its petroleum and petrochemicals department. His responsibilities will include sales, proposals, contracts, processes, and plant design. He joined Blaw-Knox in 1954, and for the past year has been assistant manager of the department he now heads.

### C. L. Nelson appointed

. . . Four Corners warehousing and service representative for B & W Primary Cementing Tools. Warehousing and yard facilities are in Farmington, N. M. A complete line of B & W scratchers, centralizers, and holding devices will be stocked.


*This announcement is neither an offer to sell nor a solicitation of offers to buy any of these securities. The offering is made only by the Prospectus.*

NEW ISSUE

October 16, 1958

600,000 Shares

Transcontinental Gas Pipe Line Corporation

Common Stock

(Par Value 50¢ per Share)

Price $23.375 per Share

*Copies of the Prospectus may be obtained in any State only from such of the several Underwriters, including the undersigned, as may lawfully offer the securities in such State.*

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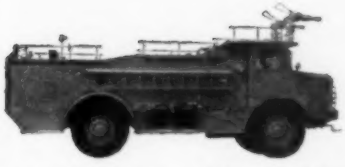
Glore, Forgan & Co. — Goldman, Sachs & Co. — Harriman Ripley & Co. Incorporated — Kidder, Peabody & Co. Incorporated

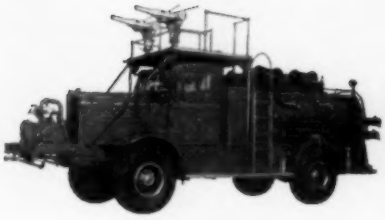
Lazard Frères & Co. — Lehman Brothers — Merrill Lynch, Pierce, Fenner & Smith

Paine, Webber, Jackson & Curtis — Smith, Barney & Co. — Dean Witter & Co.



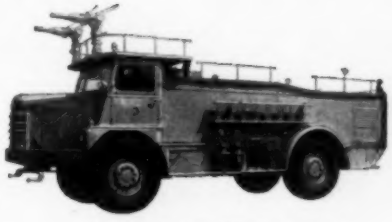
WASHINGTON, D. C., NATIONAL AIRPORT

FIRE JEEP — CRUCIBLE STEEL CO. OF AMERICA



U. S. COASTGUARD

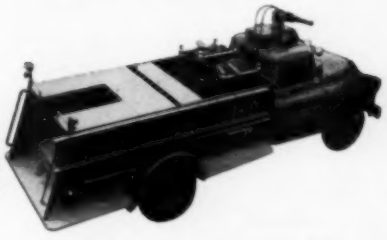
# ROCKWOOD EQUIPMENT RIDES ON LEADING FIRE TRUCKS



AIRCRAFT CRASH RESCUE TRUCK
FAIRCHILD AIRCRAFT CORP.

U. S. AIR FORCE TYPE 0-11-A

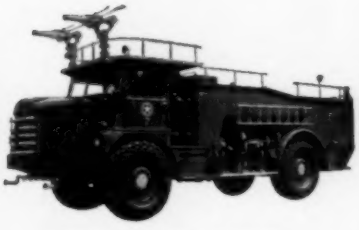
CUBA FIRE DEPT. — NEW YORK



NEW YORK THRUWAY AUTHORITY

THEODORE FRANCIS GREENE AIRPORT
HILLS GROVE R.I.

PORT OF SEATTLE
SEATTLE-TACOMA AIRPORT



GLENN L. MARTIN AIRPORT

The best testimonial of Rockwood's fire equipment is its users. In airports, industries, refineries and municipalities — Rockwood fire fighting equipment is seen on the finest fire trucks.

Fire trucks get the benefit of famous Rockwood nozzles and proportioning systems producing WaterFOG, FogFOAM, FOAM and WET — each designed to conquer different types of fires. By means of Turret Nozzles, these trucks discharge large volumes of FogFOAM, FOAM or WaterFOG. By means of Ground Sweep Nozzles, they fight flowing gasoline fires and protect firefighters and trucks at the same time. By means of Hand Lines, they control fires in hard-to-get-at areas.

If you want precision fire fighting products — by all means send for Rockwood's free booklet. Just fill in and mail the coupon at the right now. Rockwood products have been tested and listed by Underwriters' Laboratories, Inc. Distributors in all principal industrial areas.

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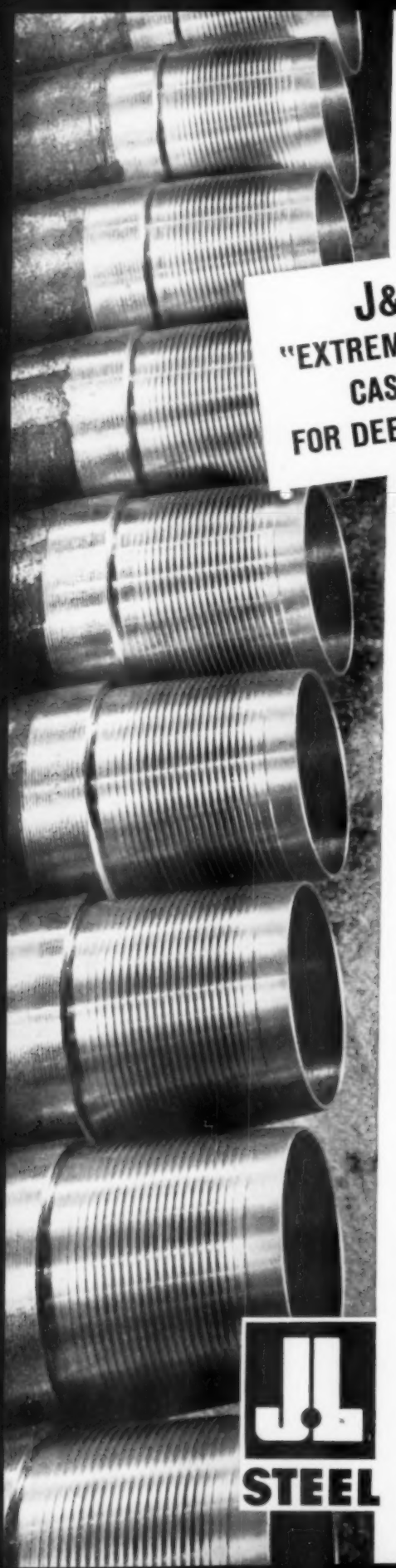
*City*.....
*Zone*.....*State*.....



**J&L "EXTREME LINE" CASING FOR DEEP WELLS**

High strength J&L Extreme Line casing was used as bottom-hole liner in this Shell Oil well in Louisiana.

# J&L Extreme Line Casing provides leak-resistant bottom-hole liner for Shell Oil well

Over 1500 feet of 7-inch J&L Extreme Line casing were used as bottom-hole liner between 10,788 and 12,288 feet in this Shell Oil well in the Humphreys field near Gibson, Louisiana. "Extreme Line casing was used for its increased clearance and high leak resistance," said Shell Oil drilling superintendent.

J&L Extreme Line casing, produced under license from The National Supply Company, offers these important advantages:

**HIGH JOINT STRENGTH.** Modified Acme-type threads, with a steep flank angle, assure strong interlock. Integral joint eliminates coupling.

**POSITIVE LEAK RESISTANCE.** Accurately machined metal-to-metal surfaces provide a positive seal.

**INCREASED CLEARANCE.** Reduced outside diameter of joints provides necessary clearance in a tight hole.

**HIGH RUNNING SPEED.** Running rates are up to 50% faster. Broad, flat-crested threads guide pin end quickly into engagement without cross-threading. Joints are made up with two to four jerks after spinning.

Investigate the unique features of J&L's Extreme Line casing, available in J-55, N-80 and P-110 grades. Ask your J&L distributor or write to Jones & Laughlin, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

This L. D. Riggs No. A-2 well was drilled to 12,300 feet with a large steam drilling rig. 1500 feet of 7-inch 29# P-110 Extreme Line casing was used. Shell also used 2987 feet of 13⅜-inch and 7089 feet of 9⅝-inch N-80 J&L casing in this well.

J&L STEEL

**Jones & Laughlin Steel Corporation**

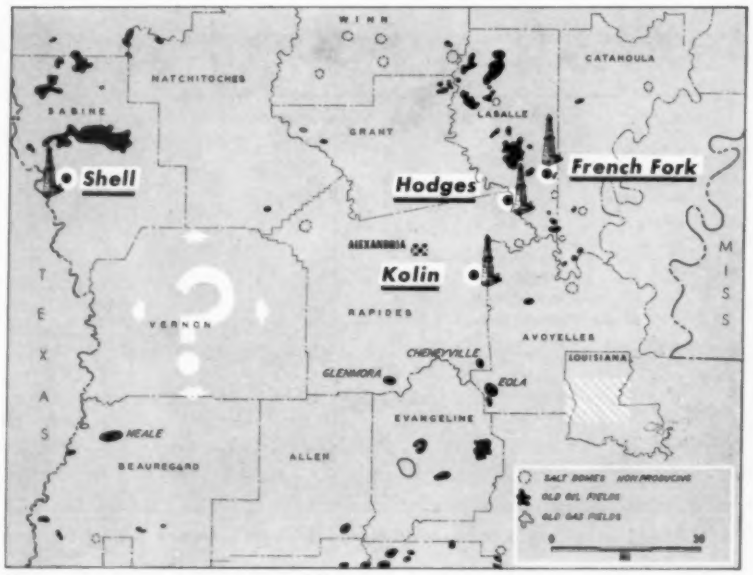
PITTSBURGH, PENNSYLVANIA

# Louisiana strikes shrink a void

BY FRANK J. GARDNER

A BIG BLANK SPOT exists in exploration of western Louisiana and eastern Texas. The question mark on the map marks the spot. It centers in Vernon Parish.

But recently a couple of wildcat discoveries have stepped out into the void to shrink it just a bit. Still there is an area of 4,000 or 5,000 sq. miles of mighty sparse exploration. North-south, it runs through Natchitoches, Vernon, and Allen parishes; east-west it lies astride Rapides and Vernon parishes, Louisiana, and Sabine, Newton, and Jasper counties, Texas. This is a geological no man's land that has seen far too little drilling to be condemned. It's an area of profound stratigraphic and structural change, separating the North Louisiana province from that of South Louisiana.




**THESE FOUR RECENT DISCOVERIES** enhance the chances for a renewed campaign across the waist of Louisiana.

**Progress to the South . . .** Perhaps the most interesting discovery in North Louisiana this year occurred in Sabine Parish at Shell Oil Co. 1 Louisiana Long Leaf Lumber Co. in Section 18-6n-12w. This is the southernmost discovery in northwestern Louisiana and it lies 8½ miles south of old Zwolle, a veteran Taylor-Cretaceous field. The Shell discovery is producing from the Saratoga-Taylor chalk at a depth of 2,840-2,900 ft.; this is a shallower pay than that of the Zwolle which is Annona-Taylor in age.

The initial potential on the well was taken September 18, and the flow was 134 bbl. daily of 42.7° oil through ¼-in. choke. Shell drilled to a total depth of 7,980 ft. and plugged back to 2,935 ft.

It's about 50 miles from Shell's new strike to the nearest other production to the south; this is Neale field (Beauregard Parish), a Wilcox-Eocene producer at the 8,300-11,500-ft. level. In this 50-mile stretch, the Cretaceous rocks dip swiftly southward off the flanks of the Sabine uplift and lie deeply buried in Beauregard Parish; the deepest well at Neale field was still in the Wilcox at 12,584 ft. We don't know much about the structural and stratigraphic conditions between these two spots, but Shell has shown us that there are excellent possibilities, at least in the southern third of Sabine Parish, for some fine new Upper Cretaceous fields.

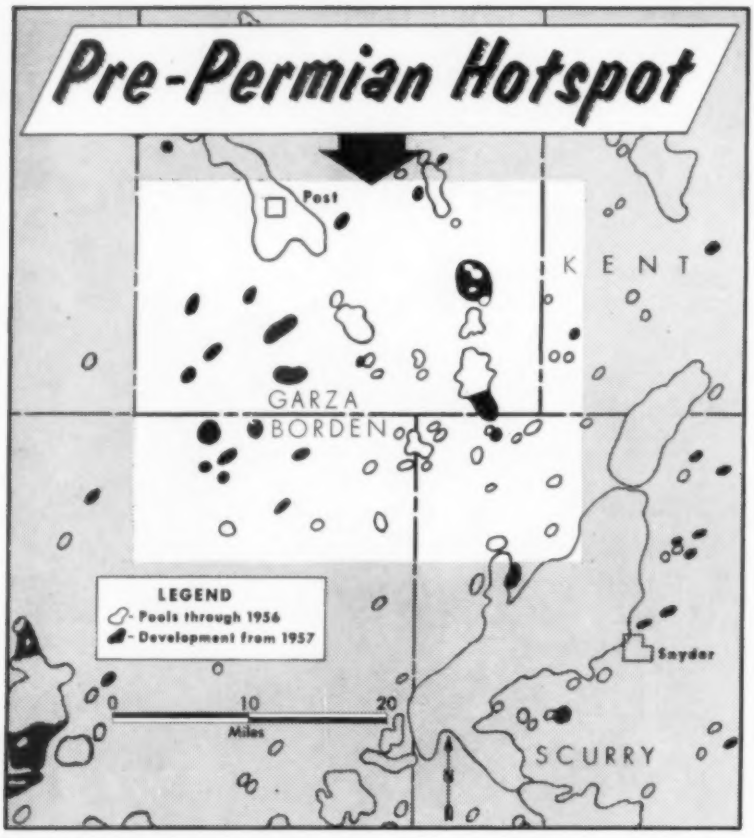
**And three hits eastward . . .** Far to the east in eastern Rapids Parish (Section 17-3n-2e), a discovery in the early part of this year marked a significant stepout from the LaSalle uplift to the southwest. This was R. J. Bassett 1 Lee Lumber Co., a 6,400-ft. Wilcox discovery, now known as Kolin field. This was only a 55-bbl. well, but the good hunting to be had on this eastern uplift has been accented in the last 2 weeks by two other Wilcox strikes. These are A. J. Hodges et al. 1 Nesbitt, Section 33-6n-3e in northeastern Rapides Parish, and Olin Oil & Gas Corp. 9 La Delta Corp. in Section 8-6n-4e, LaSalle Parish. The Nesbitt made 200 bbl. per day on ¼-in. choke, and the La Delta well flowed 200 bbl. on ⅛-in. choke.

The rapid dip of the Wilcox beds off the LaSalle uplift to the southwest is well demonstrated by the producing depths of 4,100 ft. at the Hodges strike, 6,400 ft. at Kolin, and 11,000 ft. at Glenmore field.

The northern part of our exploration no man's land lies within what is known as the inland salt basin between the Sabine uplift on the west and the LaSalle uplift on the east. It is studded with a dozen or more nonproductive salt plugs. These in themselves present a challenge to the oil finder and the fact that they haven't been exploited is lamentable.

Pan American Petroleum Corp. has had excellent success in its operations on the Minden dome in Webster Parish, northwestern Louisiana, and this should set a precedent for other operators in this part of the state. Minden is the northernmost dome in this northern Louisiana salt basin, and at least 20 similar domes await the drill farther south.

**Rate a close look . . .** These quiet discoveries in relatively unexplored country give ample proof that there is plenty of oil yet to be found here at home. Those who continually proclaim that we have run out of places to drill in this country should take a good hard look at Vernon, Natchitoches, Allen, Winn, Grant, and Rapides parishes.




**DARK AREAS** on the map represent discoveries and development over the past year.

# Midland exploration swells

A 700-SQ. MILE AREA on the northeast side of the Midland basin, covering Southwest Garza County and North Borden County, has blossomed into the most active pre-Permian exploration area in the Permian basin of West Texas.

From June 1951 to January 1956, only two pre-Permian discoveries were reported in the area, and both of them now are depleted. So far in 1958, operators have reported 15 new pools from below the Permian formations.

Four deep strikes were reported in 1957 and two in 1956.

The wildcat success-failure ratio since January 1, 1957, has been far better than average, with 19 of 30 tests drilled below 8,000 ft. being completed as strikes, for a 63% successful-completion ratio.

So far in 1958, the successful-completion rate has been 71%.

As of October 1, there were 17 deep projects working the 700-sq.-mile region: 11 in Borden County and 6 in Garza.

The present heavy exploration program was started in the same manner by which most "hot" areas come into being. A wildcatting program was started in 1956 in both Borden and Garza counties, with 16 deep projects drilled. Fourteen of the ventures were dry holes, with two resulting in new field discoveries.

These two strikes, one in Garza and one in Borden, set the pattern for the play which was to spread and cover North Borden and Southwest Garza counties.

Before Midwest Oil Corp. completed its 1 Scott, opener of West Myrtle (Strawn) field in Borden County, only one field in this 700-sq. mile area was classed as a commercial producer. This was the Fluvanna (multipay) field of Borden and Scurry counties.

The Midwest strike was reported January 23, 1956. On August 15, 1956, Neville G. Penrose and R. S. Anderson 1-X Miller was completed to open the Rocker A, South (Strawn) field in Garza County at the northeast edge of the present trend play.

Four months later, on January 11, 1957, Paul C. Teas of Dallas reported completion of his 1-A Slaughter, Strawn discovery which opened the one-well Teas field at the north edge of the trend.

These three discoveries brought in more wildcat activity and the play was on, with the next discovery being a Wolfcamp strike in the Rocker "A," South pool in Garza by Penrose and Anderson's 1-X Miller.

Shell Oil Co. spread the area south with the completion of 1-A Miller at the extreme southeast end of the area in May 1957.

Mississippian production was added to the area with completion of Humble Oil & Refining Co. 2 Slaughter in Southwest Garza County.

These six discoveries, none closer than 10 miles to any of the others, partially outlined the 700-sq. mile area. All that was left was for operators to start filling in the voids.

In quick succession 10 more deep fields were opened, starting with the U-Lazy-S (Ellenburger) field in Southwest Garza County by Shell's 1-B Slaughter.

During the first 2 months of 1958 four of the new pools were found.

T. M. Evans of Fort Worth opened Happy (Strawn) field 7 miles south of the Teas (Strawn) field in Southwest Garza County with completion of 1 Slaughter.

This strike was followed by the discovery of Teas (Ellenburger and Strawn) area 3 miles to the north by Shell 1-C Slaughter. Next came the U-Lazy-S (Pennsylvanian) field in North Borden County, opened by Shell 1-BA Slaughter.

At this point most of the wildcat activity shifted to North Borden County, where six more discoveries were reported during the period from June through August.

These strikes included the two-pay Dunigan (Ellenburger and Strawn) field by James Dunigan and Curry Oil Co. 1 Waddell; Rafter Cross (Ellenburger) by Harper & Huffman 1 Miller.

Myrtle, West (Ellenburger) by Midwest 1 Hunnicut; NSD (Ellenburger) opened by W. A. Moncrief 1 Miller and Hood (Pennsylvanian) by Shell 1 Miller.

In addition to the pre-Permian strikes, six Permian discoveries have been completed in the Southwest Garza and North Borden areas since the deep play started.

The biggest of these Permian strikes is the Koonsman (Spraberry) field east of the U-Lazy-S pool in North Borden County. It was opened in June 1957 by Sinclair Oil & Gas Co. 1 Koonsman.

## Southwest rockhounds gather at Corpus Christi . . .

MORE than 1,400 geologists from 10 societies are expected for the eighth annual meeting of the Gulf Coast Association of Geological Societies and the annual meeting of the Gulf Coast section of the Society of Economic Paleontologists and Mineralogists in Corpus Christi, Tex., October 27-29.

On the agenda for this year's convention are such items as a symposium on present and future economics of the oil industry as discussed from various points of view by prominent speakers and the presentation of 18 technical papers by geologists from Texas, Louisiana, and Florida.

Roland A. Whealy, assistant administrator, Voluntary Oil Import Program, Washington, D. C., will be one of the featured speakers.

Other symposium speakers are Antonio Garcia Rojas, exploration manager of Petroleos Mexicanos; Texas Railroad Commissioner William J. Murray, Jr.; Dr. M. King Hubbert, chief consultant for Shell Development Co. at Houston; Dr. W. B. Mather, chairman of the Mineral Technology Dept. of the Southwest Research Institute at San Antonio; J. J. O'Brien, San Antonio independent and former president of the Texas Independent Producers and Royalty Owners Association; Frank E. McGonagill, Jr., with the Bank of the Southwest at Houston; and Dr. Samuel P. Ellison, Jr., chairman of the geology department at the University of Texas.

Meeting headquarters for 1,400 geologists and 600 wives will be in Exposition Hall, with meetings also in the adjoining Memorial Coliseum.

A post-meeting field trip is planned for Thursday, Friday, and Saturday, October 30 through November 1. The purpose of the trip is to examine the relationship between recent sediments and their environments of deposition in order to better interpret the subsurface.

Participants will travel along the South Texas Coast between Rockport and Brownsville to study late Pleistocene and recent sediments and faunas, modern deltaic and interdelatic environments, and the geology of the coastal region.

Dr. Alan Lohse, independent geological consultant, is president of the GCAGS and heads the general-arrangements committee. R. C. Wilshusen, with Core Lab, Inc., is general convention chairman; W. H. Wallace, Jr., independent operator, is treasurer of GCAGS; and C. Wayne Holcomb, with Humble, is program chairman.

Members of the Gulf Coast Association of Geological Societies include those at Corpus Christi, San Antonio, Houston, Beaumont, Tyler, Shreveport, Lake Charles, Lafayette, New Orleans, Jackson, Miss., and Tallahassee, Fla.

## and on the University of Texas Campus

TEXAS GEOLOGISTS will report on new ideas and research findings at Texas University's Conference on Geology of Texas October 31.

More than 400 Southwestern geologists are expected.

The conference, part of the university's seventy-fifth-year observance, is sponsored by the geology department and the university's bureau of economic geology.

For years geologists have been wary of drilling extremely deep wells for fear the heat and pressure would be so great there would be no oil or gas production, but Addison Young, Phillips Petroleum Co. geologist from Midland, will disprove this old theory when he reports on the geology encountered on digging the "deepest hole in the world"—a well successfully drilled 25,000 ft. deep south of Fort Stockton.

Joseph D. Martinez, geophysicist with Humble Oil & Refining Co. in Houston, will report on research he conducted with Humble Geophysicist D. H. Statham and Lynn G. Howell on "Paleomagnetic Studies of Some Texas Rocks."

James Lee Wilson, with Shell Development Co.'s exploration and production research division, Houston, will report on his research with Otto P. Majewske on ancient deeply buried, oil-producing rocks of West Texas.

Other speakers for the one-day session are Henry F. Nelson, Magnolia Petroleum Co., Dallas, who will discuss "Deposition and Alteration of the Edwards Formation of Central Texas;" Frank B. Conselman, Abilene consulting geologist, "Pennsylvanian Reef Patterns in West-Central Texas," and John H. Nicholson, Amarillo consulting geologist, "Geology of the Texas Panhandle."

## Red Fish Reef stretches westward

PRODUCTIVE LIMITS of the widespread and prolific Red Fish Reef field in Galveston Bay, Chambers County, Texas, are being pushed farther westward with a good gas-condensate well.

The well is Humble Oil & Refining Co.'s 93-A State, in Tract 248. It is completed in Frio sand at 8,735-40 ft. with a potential open flow of 74 M.M.c.f.d. of gas. Liquid recovery, not gaged, is 51.8° condensate.

Its location is less than a half mile from oil production but is more than a mile from the nearest gas-condensate well, located in the heart of the field.

Hole was drilled to 8,825 ft.

## Lipscomb well hits third pay zone

A TEXAS PANHANDLE strike, the Apache Oil Corp.-Blackwell Oil & Gas Co. 1 Bradford C NE NE Section 686, Block 43, H&TC Survey, Lipscomb County, already a gas producer from two zones, now is flowing 45 bbl. of oil per hour from a third pay.

The oil flow is from the Tonkawa, perforated from 6,510-18 ft., gaged in 1 hour through a 12/64-in. choke. The flow pressure was 800 lb. and the tubing pressure was 1,200 lb.

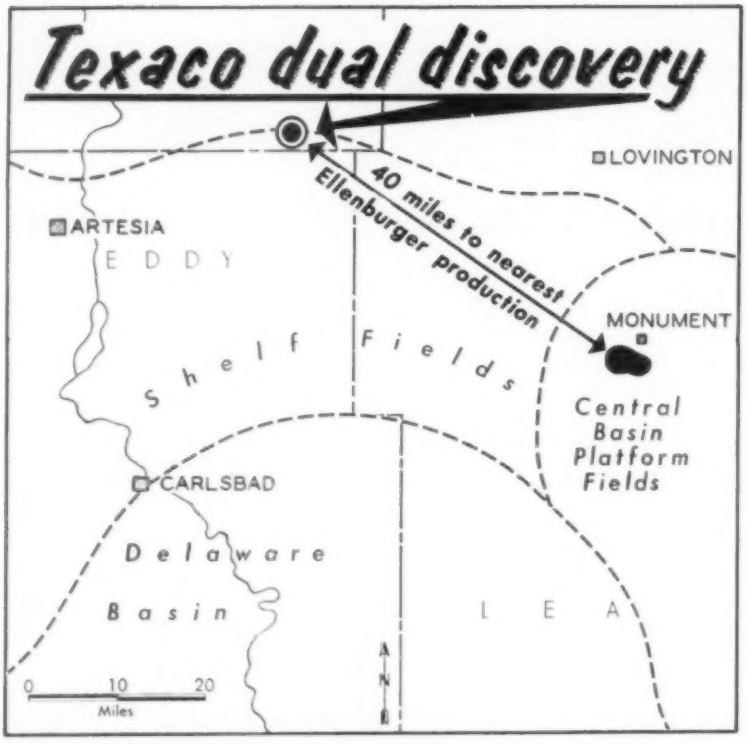
Earlier the Bradford, a wildcat 3 miles northwest of the town of Lipscomb, gaged 14 M.M.c.f. of gas in a 10-minute test in the lower Morrow, 9,803-13 ft. The hole was deepened to the Mississippian from 9,950-70 ft. and a 3,750 M.c.f. gas flow was recorded. The well was plugged at 6,556 ft. for the Tonkawa sand test.

## Arizona's biggest well completed

ARIZONA'S biggest oil well was officially completed by Humble Oil & Refining Co. last week. The East Boundary Butte field extension made 562 bbl. per day on completion gage.

Flow is from Hermosa-Pennsylvanian perforations at 4,594-4,644 and 4,726-72 ft. Flow was through ¼-in. choke.

This new producer is located 1 mile south of the 1 Navajo-Tribal, a 1955 state opener which flowed 47 bbl. of oil and 4,141 M.c.f.d. of gas.




**RELATIVE LOCATION** of The Texas Co.'s recent dual Devonian and Ellenburger discovery in southern Chaves County, New Mexico. The Ellenburger production is reported to be the first off the Central basin platform of West Texas and New Mexico. Nearest Ellenburger oil is shown near Monument in Lea County. Completion at Texaco 1 Peery-Federal was for 1,053 bbl. of 55°-gravity oil a day from the Devonian at 11,050-11,134 ft., and 28 bbl. of condensate plus 1,096 M.c.f. of gas from the Ellenburger at 12,068-12,106 ft. Location is 29-15s-30e.

## California seeks new oil vistas

DESPITE the poor supply-demand picture in California, wildcatters continue to search for new reserves in remote areas of the state and around known production. A rundown on current wildcatting turns up these interesting tests:

... **Border Oil & Gas Corp.** staked location for a 3,000-ft. test about 10 miles southeast of Holtville in Imperial County near the Mexican border. This wildcat is several hundred miles from the nearest production.

... **Union Oil Co. of California** has staked location for a wildcat about 2 miles southeast of the Moffat Ranch gas field in Madera County.

... **Western Gulf Oil Co.** reported recovering small quantities of gas on a formation test of an interval at 7,410-7,500 ft. on a wildcat 3 miles southeast of Arbuckle gas field in Colusa County. The operator was drilling ahead below 8,100 ft.

... **Guiberson & Burke Co.** was plugging back the 6,544-ft. wildcat it was drilling in East Hollywood preparatory to kicking it out on a redrill job. This "no-dope" hole is located on the old Los Angeles oil field.

... **In another part** of metropolitan Los Angeles, Richfield Oil Corp. was leveling a drill site for a test at another part of the Los Angeles field about 4 miles northeast of the Guiberson & Burke wildcat. This Richfield wildcat is in the Silverlake district.

... **In Riverside County,** 3½ miles from the nearest production, J. B. Nelson was setting a whipstock at 1,200 ft. in a 2,000-ft. wildcat located near the town of Corona.

## North Tejon adds another producer

ITS SECOND WELL in the Highway area of North Tejon field in Kern County has been brought in by Reserve Oil & Gas Co. It is about ¼ mile southeast of Richfield Oil Corp.'s Highway pool discovery well.

The new Reserve well, 302-19 "W-T," was completed in one of two intervals. The upper zone at 9,204-9,510 ft. was making 589 bbl. daily through a 16/64-in. choke. The lower zone was shut in with a reported 3,700-psi. casing pressure.

This well is two locations south of Reserve's other Highway area well.

**Second Rancho well under way . . .** Signal Oil & Gas Co. has spudded in its second test of the municipally owned Rancho Golf Course in West Los Angeles. This new test, 2 Signal-Richfield-Rancho will be bottomed under the course.

On neighboring Hillcrest Country Club, Signal was drilling below 9,794 ft. on another wildcat.

The third golf-course wildcat in West Los Angeles, Hudson Gas & Oil Corp's 2 Los Angeles Country Club, was drilling below 6,779 ft.

**Third San Emidio test . . .** Richfield Oil Corp. had cemented 7-in. casing to 11,556 ft. in 63-9 KCL-H, its third well in the San Emidio Nose field of Kern County. This latest effort is located about 2,000 ft. northeast of the discovery well.

## Bit cuts into Kentucky record

A NEW DEPTH RECORD for the entire State of Kentucky has been made as United Fuel Gas Co. drills ahead below 9,920 ft. in Cambrian formations at its 1 S. B. Williams in Breathitt County.

Located on Quicksand Creek about 4 miles east of Jackson the test topped Mississippian Big lime at 1,033 ft.; Berea at 1,562 ft., Corniferous lime 1,921 ft. and Knox dolomite 4,560 ft.

Previous depth record, also by the same company, was established only a few months ago when a test in Leslie County bottomed at 9,432 ft. presumably in Precambrian sediments.

## Oklahoma's Laverne extends west

LAVERNE FIELD in northwestern Oklahoma's Harper County continues to grow westward. Shell Oil Co. 1-34 Robertson, C SE NW 34-26n-26w, is a 1-mile extension discovery prospect.

The well flowed 2,630 M.c.f.d. of gas with condensate on 12/64-in. choke from Hoover sand at 4,400-17 ft.

Elsewhere in the district, Sunray Mid-Continent Oil Co. tested 1 Barby-B in C NW SE 11-26n-26w, getting a gas flow of 3 M.M.c.f.d. from perforations in the Chester-Mississippian at 7,062-79 ft.

# St. Clair County is Michigan's top play

ST. CLAIR COUNTY Niagaran reef play has bloomed into Michigan's hottest district with the fifth consecutive oil completion, all offsets, and six active rigs.

McClure Oil Co. 1 Uppleger SE NE NW Section 22-4n-15e, flowed 40 bbl. oil natural after perforating oil zone at 2,640-45 ft. and was to be acidized in field practice to clean drilling mud from porous reef pay zone.

The area first came into attention in 1952 with the discovery of basal Salina gas by Panhandle Eastern Pipeline Co., largest single holder of leases in the St. Clair district. The oil discovery was drilled a year ago by Glen Mills, independent. Mills, Basin Oil Co., Sun Oil Co., McClure Oil Co., Musgrove Petroleum Co., Union Development Co., and Fisher-McCall, Inc., currently are operating in the area.

State hearing has been called on October 23 to consider both spacing and proration, the latter on a gas-oil ratio pattern. The reef has been cored on three wells, showing up to 205 ft. of gas and oil pay.

Although the original gas wells were classified as producing from the basal Salina and the newer oil wells from the Niagaran reef, most petroleum engineers now regard the zones as communicative if not the same. This already has brought preliminary work in the direction of communitizing and the recycling of gas.

The area as earlier developed for gas was rated a 10 billion cubic feet reserve, and limited use in winter peak market periods has been made with 94,749 M.c.f. of gas withdrawn since 1955 from the one well completed to produce gas. A proposal that the area be developed as a gas-storage reservoir and oil withdrawn and gas recycled on a gas-oil-ratio basis has been given consideration.

Crude oil is 40° gravity and currently netting to producers $2.82 per barrel after a 13-cent trucking deduction from Osceola Pipe Line Co.'s posted price.

The field is within the confines of the greater Detroit gas market.

**TOP PLAY IN MICHIGAN** presently centers in St. Clair County for development of oil in Niagaran reef. Glen Mills 2 Waltos triggered development. Wells presently are voluntarily restricted to 65 to 100 bbl. oil per day with gas ratios running to 4 M.c.f. per bbl. at higher flow levels. State proration is expected on a gas-oil ratio formula by November 1.

# North Dakota boosts deep drilling

BEAVER LODGE FIELD added four new deep completions last week. Amerada Petroleum Corp. completed two Devonian-Silurian wells and two Devonian producers in this North Dakota field.

- The 1 Giske-Strom, C NE 13-155n-96w, Williams County, flowed 138 bbl. of oil from Devonian and 84 bbl. of condensate from Silurian. Flow is on 20/64-in. choke.
- The 1 Knutson-Iverson, C NE 36-156n-96w, flowed 225 bbl. of oil from Devonian and 92 bbl. of condensate from Silurian.
- The 3 Davidson-B, C SW 35-156n-96w, made 331 bbl. of oil per day from Devonian.
- The 1 Iverson-Haugen-Ramberg Unit, C NE 6-155n-95w, flowed 229 bbl. of oil from Devonian.

These new pre-Madison producers are part of the recent deep-drilling trend that is tapping the thick section below the Mississippian, Williston's major pay section.

## Standard drills ahead in Washington

Standard Oil Co. of California was drilling ahead below 6,604 ft. on its wildcat near Silvana in Snohomish County.

# Texas' Votaw gets fifth oil strike

THE STEADILY GROWING Votaw field, 7 miles northeast of Votaw, in Hardin County, Texas Gulf Coast, got its fifth oil well and another producing zone last week.

Latest completion is Oil Reserves Corp.'s 6-B Kirby-Stephenson, which tested 265 bbl. of 37°-gravity oil per day through ⅝-in. choke with pressure of 1,075 psi. and gas-oil ratio of 1,095 cu. ft. per barrel.

Production is from Wilcox sand at 8,406-10 ft. and 8,416-20 ft. Location is 1,400 ft. southwest of Oil Reserves' field-discovery well, completed last March.

# Good recovery seen for Nebraska well

EXCELLENT RECOVERY is reported at a Denver basin wildcat in Morrill County, western Nebraska. The discovery is Nebraska Drillers and Mar Oil Co.'s 1 Stark in C SW SW 5-17n-51w, in the center of an area 3 miles long and 1¼ miles wide of previous dry holes.

Recovery on drill-stem test was 2,200 ft. of oil in the "J" Dakota Cretaceous sand. The test was at 5,198-5,213 ft.

## Pennsylvania wildcat fractured

ONE OF TWO WILDCATS currently drilling on Pennsylvania's Negro Mountain anticline, the Manufacturers Light & Heat Co. 1 Bender, was fractured in the Onondaga chert section. After fracturing the well produced 1 M.M.c.f. of gas and some salt water. The company will continue drilling and will core the Oriskany.

In Clearfield County, Pennsylvania, New York State Natural Gas Co. 7 Helen Gooden was partially drilled with an air turbodrill. The experimental test lasted for about 12 hours during which 1,000 ft. of hole was drilled through shales and siltstones of Upper Devonian age.

**...New field.** It is reported that Columbian Carbon Co. has made a new field discovery in Armstrong County. The 1 Rupert was drilled into the Oriskany sandstone, cased to total depth of 7,166 ft. It was then perforated and fractured. No additional information is available.

## New map for active Kentucky area

A NEW map showing the location of oil and gas wells in Green County, Kentucky, has been announced by Dr. Wallace W. Hagan, director and state geologist, Kentucky Geological Survey, Lexington.

The map, titled "Preliminary Oil and Gas Map of Green County, Kentucky," was compiled by Daniel J. Jones and Robert E. Hauser of the Geological Survey staff and shows the location of more than 300 wells, 200 of which are identified.

The map is being issued on a scale of 1-in. map distance equals 4,000-ft. ground distance. The base—the roads, streams, and houses—is taken from the new topographic maps. The new map has been designed so that it can be kept up to date and new maps be issued periodically. The current map is the most up-to-date map available on Green County.

"The new map should be of special interest to the oil and gas industry," Dr. Hagan reported, "because some 100 drilling rigs are currently operating in the county and the oil production between January and July of this year increased almost six times. This is the most active area for exploration in Kentucky at present."

The maps can be purchased at the Kentucky Geological Survey office on the University of Kentucky campus.

## Corpus Christi well has good flow

THE NEW DISCOVERY WELL drilled by Carrl Oil Co. and associates just southwest of Corpus Christi, in Nueces County, is rated good for 136 bbl. of oil per day, flowing through 5/32-in. choke.

The well, 1 Eleanor Kelly, is completed in Frio sand at 6,266-69 ft. after drilling to 8,515 ft.

Location is 2 miles from nearest production, located in Saxet field, on the north, and South Clarkwood field, on the west.

Gravity of the oil production is 36° Flowing pressure is 500 psi.

Associated with Carrl Oil Co. are Shore Oil & Development Co., and George H. Coates. Operators propose "Kelly Ranch" as the name of the new field.

## Pacific Coast AAPG will meet

MORE THAN 1,000 geologists and geophysicists are expected to discuss new discoveries and developments in the Pacific Coast region at the thirty-fifth annual meeting of the Pacific Section, American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, to be held at the Ambassador Hotel in Los Angeles, on Thursday and Friday, November 6 and 7, 1958.

U. S. Grant IV of UCLA, president of the AAPG Pacific Section, and Richard E. Faggioli of Humble Oil & Refining Co., general convention chairman, announced this week that the Thursday joint AAPG-SEG-SEPM luncheon will be keynoted by "The Firing of the Explorer Satellite," a talk of tremendous current interest to be presented by the Solid-Rocket section of the Cal Tech jet-propulsion laboratory. Of interest to all, this talk is nontechnical and will be accompanied by a film entitled "X-minus 80 Days."

Highlight of the convention program will be a symposium on "Lateral Faulting in California." Other talks of widespread interest will pertain to recent offshore leasing, and to the relation of Alaskan statehood to oil exploration. The annual dinner-dance will be held Friday evening at the Ambassador, featuring the Leighton Noble orchestra.

## S. E. Texas field steps eastward

PROLIFIC PRODUCTION in the developing Port Acres gas-condensate are north of Port Arthur, in southeastern Jefferson County, Texas Gulf Coast, stepped a mile eastward with a newly completed discovery by Meredith & Co., which drilled the original discovery well in 1957.

The new well, 1 Doornbos, is productive from a 12,000-ft. sand, about 1,500 ft. deeper than the present producing zone in the field. It is rated good for 10,500 M.c.f.d. of gas.

## Off-Nesson strike opens Williston pool

AN IMPORTANT Williston basin discovery was completed last week by Skelly Oil Co. The 1 Tank, C NE NW 34-152n-96w, McKenzie County, North Dakota, made 218 bbl. of oil daily on 14/64-in. choke from Madison - Mississippian perforations at 9,176-84 ft.

The new field opener is located 4 miles west of Blue Buttes field off the west flank of the Nesson anticline. Its importance is that it is in an area of previous dry hole drilling. The immediate area around Skelly Oil's discovery, however, is now wide open for future development.

## Here's rundown on Texas' Rodessa play

NEW RODESSA Lower Cretaceous production is indicated at a Freestone County well in East Texas. The discovery prospect is Watburn Oil Co. 1 Anderson Edens unit, 6 miles east of Streetman in the north part of the county.

Gas flowed on drill-stem tests at 6,653-67 ft. and at other intervals down to 6,846 ft. Drilling is now below 6,873 ft. in shale to test the Pettet and Travis Peak formations. The indicated gas strike is in the J. Roque Survey, A-525, 5 miles northeast of Pettet production at South Streetman field and 4 miles north of Stewards Mill field.

**Rusk County** . . . Another possible Rodessa discovery is F. R. Jackson

# The September completion tally

| | TOTAL COMPLETIONS | | | | | | | WILDCAT WELLS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Crude | Cond. | Gas | Dry | Service | Footage | Total | Crude | Cond. | Gas | Dry | Footage | C.T. | Act. op. |
| Alabama | 9 | 5 | 0 | 0 | 4 | 0 | 62,947 | 4 | 0 | 0 | 0 | 4 | 5,255 | 0 | 19 |
| Arizona | 1 | 0 | 0 | 0 | 1 | 0 | 1,820 | 1 | 0 | 0 | 0 | 1 | 1,820 | 1 | 13 |
| Arkansas | 96 | 52 | 1 | 6 | 37 | 0 | 308,387 | 12 | 0 | 1 | 1 | 10 | 49,529 | 0 | 111 |
| California | 87 | 50 | 0 | 1 | 36 | 0 | 412,687 | 30 | 3 | 0 | 0 | 27 | 152,070 | 3 | 123 |
| Colorado | 79 | 15 | 0 | 9 | 55 | 0 | 393,268 | 42 | 2 | 0 | 1 | 39 | 199,295 | 0 | 100 |
| Florida | 1 | 0 | 0 | 0 | 1 | 0 | 7,005 | 1 | 0 | 0 | 0 | 1 | 7,005 | 0 | 1 |
| Illinois | 276 | 117 | 0 | 0 | 159 | 0 | 650,523 | 63 | 7 | 0 | 0 | 56 | 132,157 | 40 | 380 |
| Indiana | 93 | 39 | 0 | 0 | 54 | 0 | 147,579 | 27 | 7 | 0 | 0 | 20 | 39,545 | 60 | 111 |
| Kansas | 355 | 148 | 0 | 25 | 168 | 14 | 1,229,218 | 60 | 5 | 0 | 0 | 55 | 230,419 | 5 | 451 |
| Kentucky | 130 | 48 | 0 | 7 | 75 | 0 | 205,823 | 29 | 4 | 0 | 0 | 25 | 49,722 | 110 | 150 |
| Louisiana | 318 | 146 | 33 | 23 | 116 | 0 | 2,193,131 | 48 | 4 | 3 | 2 | 39 | 419,147 | 0 | 429 |
| North | 149 | 76 | 0 | 20 | 53 | 0 | 501,106 | 25 | 3 | 0 | 2 | 20 | 138,604 | 0 | 179 |
| South | 140 | 54 | 29 | 2 | 55 | 0 | 1,390,777 | 19 | 0 | 3 | 0 | 16 | 235,168 | 0 | 210 |
| Offshore | 29 | 16 | 4 | 1 | 8 | 0 | 301,248 | 4 | 1 | 0 | 0 | 3 | 45,375 | 0 | 40 |
| Michigan | 28 | 10 | 0 | 1 | 14 | 3 | 69,243 | 8 | 0 | 0 | 1 | 7 | 15,719 | 17 | 98 |
| Mississippi | 35 | 15 | 2 | 0 | 18 | 0 | 297,223 | 17 | 2 | 0 | 0 | 15 | 143,598 | 0 | 51 |
| Missouri | 1 | 0 | 0 | 1 | 0 | 0 | 538 | 1 | 0 | 0 | 1 | 0 | 538 | 1 | 1 |
| Montana | 36 | 19 | 0 | 0 | 16 | 1 | 184,779 | 10 | 0 | 0 | 0 | 10 | 29,243 | 2 | 50 |
| Nebraska | 60 | 27 | 0 | 0 | 33 | 0 | 375,408 | 28 | 3 | 0 | 0 | 25 | 171,408 | 0 | 49 |
| New Mexico | 138 | 61 | 2 | 39 | 36 | 0 | 615,206 | 26 | 1 | 0 | 0 | 25 | 118,020 | 27 | 200 |
| West | 67 | 15 | 2 | 38 | 12 | 0 | 298,343 | 9 | 0 | 0 | 0 | 9 | 27,789 | 4 | 122 |
| East | 71 | 46 | 0 | 1 | 24 | 0 | 316,863 | 17 | 1 | 0 | 0 | 16 | 90,231 | 23 | 78 |
| New York | 44 | 21 | 0 | 1 | 2 | 20 | 63,976 | 2 | 0 | 0 | 0 | 2 | 7,219 | 44 | 21 |
| North Dakota | 42 | 26 | 0 | 0 | 16 | 0 | 237,025 | 12 | 3 | 0 | 0 | 9 | 65,111 | 0 | 60 |
| Ohio | 57 | 20 | 0 | 12 | 19 | 6 | 140,344 | 1 | 0 | 0 | 0 | 1 | 1,983 | 56 | 235 |
| Oklahoma | 592 | 302 | 9 | 27 | 205 | 49 | 1,871,354 | 74 | 14 | 3 | 2 | 55 | 324,536 | 139 | 811 |
| Pennsylvania | 35 | 9 | 0 | 9 | 8 | 9 | 123,640 | 2 | 0 | 0 | 0 | 2 | 8,352 | 34 | 29 |
| South Dakota | 2 | 0 | 0 | 0 | 2 | 0 | 6,236 | 2 | 0 | 0 | 0 | 2 | 6,236 | 0 | 4 |
| Tennessee | 2 | 0 | 0 | 1 | 1 | 0 | 1,440 | 2 | 0 | 0 | 1 | 1 | 1,440 | 2 | 2 |
| Texas | 1,608 | 825 | 49 | 81 | 615 | 38 | 6,542,959 | 366 | 33 | 11 | 6 | 316 | 1,739,637 | 94 | 997 |
| Dist. 1 | 99 | 43 | 3 | 1 | 52 | 0 | 242,672 | 37 | 1 | 0 | 0 | 36 | 86,085 | 6 | 38 |
| Dist. 2 | 69 | 13 | 11 | 7 | 38 | 0 | 445,513 | 22 | 0 | 2 | 1 | 19 | 153,736 | 0 | 40 |
| Dist. 3 | 112 | 46 | 10 | 2 | 54 | 0 | 701,262 | 27 | 3 | 2 | 0 | 22 | 220,763 | 0 | 86 |
| Dist. 4 | 105 | 29 | 7 | 7 | 62 | 0 | 530,674 | 37 | 2 | 2 | 0 | 33 | 196,820 | 0 | 50 |
| East | 121 | 58 | 8 | 1 | 54 | 0 | 566,623 | 35 | 0 | 2 | 0 | 33 | 176,786 | 0 | 61 |
| Dist. 7-B | 224 | 95 | 1 | 1 | 122 | 5 | 596,473 | 72 | 7 | 0 | 1 | 64 | 218,856 | 0 | 82 |
| West | 432 | 325 | 6 | 3 | 88 | 10 | 2,089,493 | 69 | 13 | 3 | 0 | 53 | 386,206 | 38 | 459 |
| Dist. 9 | 318 | 159 | 1 | 13 | 122 | 23 | 837,120 | 50 | 7 | 0 | 1 | 42 | 190,539 | 50 | 80 |
| Dist. 10 | 128 | 57 | 2 | 46 | 23 | 0 | 533,129 | 17 | 0 | 0 | 3 | 14 | 109,846 | 0 | 101 |
| Utah | 25 | 16 | 0 | 2 | 7 | 0 | 149,268 | 8 | 1 | 0 | 0 | 7 | 53,746 | 0 | 50 |
| Washington | 1 | 0 | 0 | 0 | 1 | 0 | 5,069 | 1 | 0 | 0 | 0 | 1 | 5,069 | 0 | 1 |
| West Virginia | 69 | 7 | 0 | 51 | 11 | 0 | 185,468 | 1 | 0 | 0 | 1 | 0 | 6,412 | 69 | 118 |
| Wyoming | 89 | 38 | 0 | 6 | 45 | 0 | 384,620 | 27 | 0 | 0 | 0 | 27 | 139,024 | 4 | 138 |
| Sept. 1958 | 4,309 | 2,016 | 96 | 302 | 1,755 | 140 | 16,866,184 | 905 | 89 | 18 | 16 | 782 | 4,123,255 | 708 | 4,803 |
| Aug. 1958 | 3,763 | 1,742 | 100 | 343 | 1,483 | 95 | 15,114,260 | 739 | 61 | 16 | 24 | 638 | 3,432,077 | 711 | 4,736 |
| Cum. 1958 | 35,476 | 17,293 | 860 | 2,715 | 13,694 | 914 | 146,614,923 | 7,091 | 696 | 124 | 204 | 6,067 | 33,154,709 | 5,993 | ... |
| Cum. 1957 | 39,958 | 20,730 | 416 | 2,855 | 15,127 | 830 | 165,279,546 | 8,841 | 920 | 73 | 291 | 7,557 | 42,305,192 | ... | ... |

D.D. = 29: Mont. 3, Wyo. 1, N. La. 1, Ill. 3, Okla. 17, Ala. 2, Texas (3) 1, Texas (2) 1.

# . . . and in Western Canada

| | TOTAL WELLS | | | | | | | WILDCATS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Oil | Gas | Dry | Service | Footage | Cum. 1958 | Total | Oil | Gas | Dry | Footage | Cum. 1958 |
| Alberta | 119 | 76 | 9 | 26 | 8 | 644,775 | 1,202 | 28 | 4 | 4 | 20 | 149,688 | 316 |
| Saskatchewan | 72 | 42 | 3 | 26 | 1 | 312,398 | 558 | 24 | 2 | 3 | 19 | 101,766 | 147 |
| Manitoba | 5 | 3 | 0 | 2 | 0 | 9,249 | 71 | 2 | 0 | 0 | 2 | 3,131 | 10 |
| British Columbia | 4 | 1 | 2 | 1 | 0 | 31,602 | 65 | 3 | 0 | 2 | 1 | 27,578 | 48 |
| Northwestern Territories | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 7 |
| Western Canada | 200 | 122 | 14 | 55 | 9 | 998,024 | 1,903 | 57 | 6 | 9 | 42 | 282,163 | 528 |

and John C. Robbins, Jr., 1 Mrs. Winnie Lee Gary et al., 6 miles south of Henderson.

Shows were reported on core of the Hill section of the Rodessa near 6,700 ft. A drill-stem test flowed an unestimated flow of gas. The well is currently going below 7,200 ft. for a look at Pettet and Travis Peak.

This East Texas prospect is in the Piburn Survey, A-28, 4 miles south of production in South Henderson field.

**Anderson County . . .** Other Rodessa news includes W. D. McBee's 1 Adam Cone, Jr., gas unit strike 2 miles southeast of Bethel in northwestern Anderson County. This well flowed an unestimated amount of gas on ¼-in. choke from perforations at 9,793-9,839 ft. The well is in the A. M. Lewis Survey, A-481, J. N. Acosta Grant.

**Oakwood dome . . .** Good oil production is reported at an Oakwood

## Service, condensate-well depth breakdown, September

| | Service wells | | | | | Field condensate | | | | | | Wildcat condensate | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | D | E | F | G | H | I | D | E | F | G | H |
| Arkansas | | | | | | | | | | | | | | 1 | | |
| Kansas | 2 | | 7 | 5 | | | | | | | | | | | | |
| Louisiana | | | | | | | 1 | 1 | 13 | 8 | 7 | | | | 1 | 2 |
| South | | | | | | | 1 | 1 | 10 | 7 | 7 | | | | 1 | 2 |
| Offshore | | | | | | | | | 3 | 1 | | | | | | |
| Michigan | | 3 | | | | | | | | | | | | | | |
| Montana | | 1 | | | | | | | | | | | | | | |
| New Mexico | | | | | | | 1 | 1 | | | | | | | | |
| West | | | | | | | 1 | 1 | | | | | | | | |
| New York | | 20 | | | | | | | | | | | | | | |
| Ohio | | 4 | 2 | | | | | | | | | | | | | |
| Oklahoma | 3 | 31 | 12 | 3 | | | 5 | 1 | | | | | | 3 | | |
| Pennsylvania | | 9 | | | | | | | | | | | | | | |
| Texas | 15 | 12 | 9 | 2 | | 2 | 12 | 17 | 7 | | | 1 | 2 | 6 | 2 | |
| District 1 | | | | | | | | | 3 | | | | | | | |
| District 2 | | | | | | 2 | 3 | 4 | | | | | 1 | 1 | | |
| District 3 | | | | | | | 1 | 5 | 2 | | | | | 2 | | |
| District 4 | | | | | | | 2 | 3 | | | | | | 2 | | |
| East | | | | | | | 2 | 4 | | | | 1 | 1 | | | |
| District 7-B | 2 | 2 | 1 | | | | 1 | | | | | | | | | |
| West | | 3 | 7 | | | | 1 | | 2 | | | | | 1 | 2 | |
| District 9 | 13 | 7 | 1 | 2 | | | 1 | | | | | | | | | |
| District 10 | | | | | | | 1 | 1 | | | | | | | | |
| Mississippi | | | | | | 1 | | 1 | | | | | | | | |
| **Total United States** | **20** | **80** | **30** | **10** | | **3** | **19** | **21** | **20** | **8** | **7** | **1** | **2** | **10** | **3** | **2** |
| Canada | | | | 1 | 8 | | | | | | | | | | | |
| Alberta | | | | | 8 | | | | | | | | | | | |
| Saskatchewan | | | | 1 | | | | | | | | | | | | |

Dome field area well, the W. D. McBee 1 Bernice D. Sherman in northern Leon County.

The well was completed flowing 207 bbl. of oil daily on 12/64-in. choke from the Woodbine at 5,749-64 ft. Location is in the William Feller Survey, A-274. This well is about ½ mile southwest of The Texas Co.'s 1 Rabe discovery well at Oakwood dome.

## Marshland wildcat hits dry gas

DRY GAS production is reported in a newly completed discovery well 3½ miles southwest of Lake Decade field in the coastal marshlands of Terrebonne Parish, Louisiana. Lake Decade field, discovered in 1942, is oil productive (34.5° gravity).

The new discovery is by Union Oil Co. of California at its 1-S Louisiana Land & Exploration Co., which tested 5,300 M.c.f.d., flowing through 5/32-in. choke. Pressure is 4,100 psi. Completion is at 12,122-35 ft. after hole had been drilled to 14,500 ft.

Lake Decade field's oil production is from a 10,200-ft. sand. Superior Oil Co. is operator there, having drilled three wells.

## *Successful Wildcats*

### BRITISH COLUMBIA

Pacific 17 Buick Creek, Unit 17 Zone C NTS Map 94-A-14. Nikinassin gas discovery. TD 3,711 ft.

### CALIFORNIA

Los Angeles County: Signal Oil and Gas Co. 1 Signal-Richfield-Rancho, 36-1s-15w, 310 BOPD, 56.6° gravity, 18/64-in. choke, perfs. 230 ft. of perfs. bottomed at about 9,500 ft., TD 12,688 ft. (New pool discovery on Rancho Golf Course in West Los Angeles.)

### SOUTH LOUISIANA

Allen Parish: Lamar Hunt 1 Rice Land & Lumber Co., 28-5s-5w (2 miles northeast of Harmony Church field). IP 171 BOPD and 1,233 M.c.f.d., 5/32-in. 53.8°, TP 3,125 psi., perfs. 9,828-46 ft. TD 10,004 ft. (New field.)

Evangeline Parish: Sun Oil Co. 1 Fontenot, 18-6s-1w. IP 16 BOPD and 1,467 M.c.f.d., $\frac{7}{8}$-in., 51.3°, TP 2,875 psi., perfs. 7,988-92 ft. TD 8,705 ft. (Second well and new pay in East Basile field.)

Terrebonne Parish: Placid Oil Co. et al., 6-B State-L.L.&E., 24-20s-18e. IP 3 M.M.c.f.d., wet gas, 9/64-in., TP 6,000 psi., perfs. 16,084-16,100 ft. TD 17,420 ft. (New pay in Lapeyrouse field.)

### TEXAS GULF COAST

Bee County: Texkan Oil Co. 1 Littlejohn, Lot 8, Blk. 3, Ryan Ranch Subd., Patrick Carroll Sur., A-12 (8 miles northwest of Beeville). Absolute open-flow potential 4,400 M.c.f.d., dry gas, shut-in TP 820 psi., perfs. 2,032-42 ft. (Frio). TD 9,292 ft. (New pay in Pearl field.)

Colorado County: Salt Dome Production Co. 1 Broussard-Hancock-Kallina, Hill Duffner Sur., A-823 (6½ miles northeast of Provident City). Absolute open-flow potential 7,600 M.c.f.d., dry gas, shut-in TP 1,484 psi., perfs. 3,576-82 ft. (Frio), and 6 M.M.c.f.d., dry gas, shut-in pressure 949 psi., perfs. 2,350-56 ft. (Miocene). TD 3,925 ft. (New reservoirs and extension in Garwood area.)

Chambers County: Gulf Oil Corp. 1 Annie Frankland, Henry Barker Sur., A-56 (8 miles southwest of Glen). Absolute open-flow potential 5,825 M.c.f.d., GLR 126.27 M.c.f. per barrel, 53.6°, shut-in TP 4,580 psi., perfs. 9,684-92 ft. (Frio). TD 11,489 ft. (New field—1½ miles northeast of East Smith Point field.)

Hardin County: Oil Reserves Corp. 6-B Kirby-Stephenson, James Stephenson Sur., A-444 (7 miles northeast of Votaw). IP 265.01 BOPD, $\frac{3}{8}$-in., 37°, GOR 1,095 cu. ft. per barrel, TP 1,075 psi., perfs. 8,406-10 ft. and 8,446-50 ft. (Wilcox). TD 8,525 ft. (New pay in Votaw field.)

Jackson County: H. H. Howell, M. B. Rudman and Cecil J. Cox 1 Meyer & Gabrysch, Sec. 12, Sutherland Pasture Subd., Thomas Menefee Sur., A-52 (4½ miles east of Edna). IP 153.2 BOPD, P-32 choke, 34.1°, GOR 338 cu. ft. per barrel, TP 850 psi., perfs. 6,324-25 ft. (Frio). TD 6,875 ft. (New field.)

Jasper County: Atlantic Refining Co. 1 T&NO Fee, Sec. 55, T&NO Sur., A-481 (4 miles southwest of Buna). Shut-in oil well, no gage, perfs. 7,784-88 ft. TD 9,001 ft. (New field—6 miles southwest of Bessmay field).

# September footage breakdown

| | FIELD WELLS | | | | | WILDCAT WELLS | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Oil | Cond. | Gas | Dry | Service | Oil | Cond. | Gas | Dry |
| Alabama | 57,692 | | | | | | | | 5,255 |
| Arizona | | | | | | | | | 1,820 |
| Arkansas | 130,501 | | 26,189 | 102,168 | | | 8,282 | 6,478 | 34,769 |
| California | 198,078 | | 3,500 | 59,039 | | 27,736 | | | 124,334 |
| Colorado | 67,617 | | 48,069 | 78,287 | | 11,165 | | 2,404 | 185,726 |
| Florida | | | | | | | | | 7,005 |
| Illinois | 265,806 | | | 252,560 | | 19,822 | | | 112,335 |
| Indiana | 55,045 | | | 52,989 | | 7,268 | | | 32,277 |
| Kansas | 475,202 | | 82,290 | 396,075 | 45,232 | 20,035 | | | 210,384 |
| Kentucky | 69,518 | | 12,807 | 73,776 | | 7,369 | | | 42,353 |
| Louisiana | 759,319 | 383,131 | 103,216 | 528,318 | | 30,866 | 36,126 | 11,609 | 340,546 |
| North | 162,583 | | 70,075 | 129,844 | | 21,254 | | 11,609 | 105,741 |
| South | 452,055 | 335,121 | 22,741 | 345,692 | | | 36,126 | | 199,042 |
| Offshore | 144,681 | 48,010 | 10,400 | 52,782 | | 9,612 | | | 35,763 |
| Michigan | 30,206 | | | 18,032 | 5,286 | | | 1,275 | 14,444 |
| Missouri | | | | | | | | 538 | |
| Mississippi | 111,277 | 14,330 | | 28,018 | | 22,906 | | | 120,692 |
| Montana | 120,306 | | | 33,561 | 1,669 | | | | 29,243 |
| Nebraska | 151,224 | | | 52,776 | | 17,445 | | | 153,963 |
| New Mexico | 251,537 | 16,848 | 181,532 | 47,269 | | 2,084 | | | 115,936 |
| West | 63,402 | 16,848 | 178,554 | 11,750 | | | | | 27,789 |
| East | 188,135 | | 2,978 | 35,519 | | 2,084 | | | 88,147 |
| New York | 27,050 | | 2,657 | | 27,050 | | | | 7,219 |
| North Dakota | 129,742 | | | 42,172 | | 15,836 | | | 49,275 |
| Ohio | 53,023 | | 29,497 | 41,519 | 14,322 | | | | 1,983 |
| Oklahoma | 893,390 | 38,723 | 125,146 | 386,991 | 102,568 | 89,050 | 24,971 | 9,046 | 201,469 |
| Pennsylvania | 24,669 | | 43,276 | 27,633 | 19,710 | | | | 8,352 |
| South Dakota | | | | | | | | | 6,236 |
| Tennessee | | | | | | | | 650 | 790 |
| Texas | 3,002,608 | 311,808 | 297,552 | 1,119,284 | 72,070 | 220,060 | 91,695 | 32,837 | 1,395,045 |
| Dist. 1 | 85,550 | 32,591 | 6,129 | 32,317 | | 5,255 | | | 80,830 |
| Dist. 2 | 70,808 | 64,636 | 24,131 | 132,202 | | | 14,861 | 9,308 | 129,567 |
| Dist. 3 | 259,982 | 74,901 | 5,977 | 139,639 | | 27,417 | 18,100 | | 175,246 |
| Dist. 4 | 96,720 | 38,059 | 28,772 | 170,303 | | 12,610 | 17,060 | | 167,150 |
| East | 232,495 | 44,223 | 9,340 | 103,779 | | | 11,069 | | 165,717 |
| Dist. 7-B | 233,307 | 7,233 | | 128,209 | 8,868 | 28,223 | | 380 | 190,253 |
| West | 1,447,941 | 28,815 | 21,347 | 178,097 | 27,087 | 105,506 | 30,605 | | 250,095 |
| Dist. 9 | 345,536 | 6,196 | 67,122 | 191,612 | 36,115 | 41,049 | | 4,639 | 144,851 |
| Dist. 10 | 230,269 | 15,154 | 134,734 | 43,126 | | | | 18,510 | 91,336 |
| Utah | 89,317 | | 6,205 | | | 5,585 | | | 48,161 |
| Washington | | | | | | | | | 5,069 |
| West Virginia | 16,477 | | 132,564 | 30,015 | | | | 6,412 | |
| Wyoming | 153,445 | | 39,302 | 52,849 | | | | | 139,024 |
| **Total United States** | **7,133,049** | **764,840** | **1,133,802** | **3,423,331** | **287,907** | **497,227** | **161,074** | **71,249** | **3,393,705** |
| Western Canada | 590,660 | | 25,410 | 49,946 | 49,845 | 25,100 | | 51,011 | 206,052 |
| Alberta | 402,803 | | 25,410 | 21,029 | 45,845 | 18,800 | | 26,618 | 104,270 |
| Saskatchewan | 177,715 | | | 28,917 | 4,000 | 6,300 | | 5,189 | 90,277 |
| Manitoba | 6,118 | | | | | | | | 3,131 |
| British Columbia | 4,024 | | | | | | | 19,204 | 8,374 |

Nueces County: Carrl Oil Co., Shore Oil & Development Co., and George Coates 1 Kelly, Sec. 5, R-V11, Share 1, Margaret Kelly Lands (2½ miles southeast of Clarkwood). IP 136.45 BOPD, 5/32-in., 36°, TP 500 psi., perfs. 6,266-69 ft. (Frio). TD 8,509 ft. (New field.)

### SOUTHWEST TEXAS

Hidalgo County: Northern Pump Co. 1 Harris, Sec. 159, Farm Tract 244, West Tract Subd. (4 miles north of Weslaco). Absolute open-flow potential 85 M.M. c.f.d., GLR 100 M.c.f. per barrel, shut-in TP 5,795 psi., perfs. 9,518-23 ft. (Frio). TD 9,590 ft. (New pay in North Weslaco field.)

### WEST CENTRAL TEXAS

Callahan County: Ambassador Oil Corp. 1 Frank Antilley, Sec. 57, BAL Sur., 7 mi. W Clyde. IPP 16 BOPD, 39°-gravity, GOR 435, Palo Pinto 3,214-20 ft. TD 3,220 ft.

Paramount Oil, Inc., 1 Flem Johnson, Blk. 79, Comal CSL Sur. 181, 5 mi. W Cross Plains. IPP 3 BOPD, 43°-gravity, pay 1,534 ft. TD 1,544 ft.

Taylor County: Bridwell Oil Co. 1-A Galle, Guadalupe CSL Sur. 120, 3 mi. W View. IP 98 BOPD, 10/64-in., 41°-gravity, GOR 475, TP 320 psi., pay 4,420-27 ft. TD 4,538 ft.

### WEST TEXAS

Garza County: Paul C. Teas 1 Skeeter Slaughter, dual discovery, 24-1-Jasper Hays Sur., 8 mi. SW Post. Pennsylvanian IP 312 BOPD, 5/32-in., 38°-gravity, GOR 626, TP 620 psi., perforated 8,168-96 ft.; Ellenburger IP 370 BOPD, 3/16-in., 39.6°-gravity, GOR 151, TP 515 psi., perforations 8,491-96 ft. TD 8,500 ft., elev. 2,577 ft.

Irion County: Phillips Petroleum Co. 1 Blakley "A," 112-1-T&P Sur., 15 mi. NW Barnhart. IPP 49 BOPD, 45°-gravity, GOR 1482, Fusselman 8,946-56 ft., TD 9,045 ft., elev. 2,512 ft.

Pecos County: Duncan, Hamm & O'Brien & Cox 1 Wilson, 26-12-H&GN, 13 mi. NW Iraan. IP 207 BOPD, 18/64-in., 40° gravity, GOR 1,406, TP 680 psi., Wolfcamp 5,804-46 ft. TD 6,505 ft., ground elev. 2,265 ft.

Scurry County: Headwaters Oil Co. 1 Wayne Rogers, 54-3-H&TC, 4 mi. NE Hermleigh. IP 281 BOPD, 24/64-in., 38°-gravity, GOR 455, TP 100 psi., Pennsylvanian 6,325-44 ft. TD 6,390 ft., elev. 2,369 ft.

Ward County: Magnolia Petroleum Co. 1 George Sealy "Section 59," Sec. 59, Blk. F, G&MMB&A Sur., 3 mi. NW Wickett. IP 113 BOPD, 8/64-in., 29°-gravity, Yates 3,199-3,205 ft. TD 3,214 ft., elev. 2,641 ft.

**DOWELL PERSONNEL,** backed by full training and current information, recommend the size and type of treatment your well should have to get the results you want. The Company's 26 years experience in well stimulation work is behind every recommendation made.

# DOWELL CAN SHOW YOU HOW TO SAVE MONEY ON FRACTURING TREATMENTS IN TODAY'S ECONOMY

Today's economy demands that well completion costs be kept to a minimum—consistent with the results desired. To achieve both economy of operation and good sound results you must call a service company that understands today's problems and can recommend the proper treatment.

Dowell fracturing treatments can be tailored to today's economy—tailored to today's market conditions. Dowell is able to offer you sensible stimulation recommendations because it has the right combination of PERSONNEL, EQUIPMENT and SERVICES. Here's how this money-saving combination works for you:

DOWELL PERSONNEL. Intensive training at every level gives the Dowell man a solid background to understand the operator's current needs. This training is further enhanced by a continuous flow of information on new techniques and materials—so that Dowell engineers can work with you intelligently. They recommend jobs based on well conditions and the results you are trying to achieve. The Company's twenty-six years experience in well stimulation work is behind every recommendation made. This knowledge and skill are cost-saving advantages for you.

DOWELL EQUIPMENT. Designed to produce best results at less cost, Dowell equipment is engineered by oil field research and development technicians. Equipment is assembled in Dowell's own shops to rigid specifications; it is tested and re-tested before release to the field. Field maintenance is rigorous to keep it in shape. It is job-engineered, with equipment for both big jobs and small jobs. You don't have to pay for more equipment than you need.

DOWELL SERVICES. Offered in a wide selection, Dowell services are adaptable to individual well conditions and situations. They can be tailored to fit your problem. Dowell offers nine basic fracturing services, each backed by both full-scale research and wide field use. Dowell is the pioneer of oil well chemical service and, as such, offers the widest variety of auxiliary services to make fracturing treatments even more successful. Dowell's variety of proved services means you can select the one best-suited to both your well conditions and the results you want.

The Dowell combination of personnel, equipment and services is the right combination for effective, money-saving stimulation treatments. For fracturing treatments tailored to today's economy, call any of the 165 Dowell service points. In Canada, call Dowell of Canada, Ltd.; in Venezuela, contact United Oilwell Service. Or write Dowell, Tulsa 1, Oklahoma.

*Services for the oil industry* DOWELL

A SERVICE DIVISION OF THE DOW CHEMICAL COMPANY

**DOWELL EQUIPMENT** is assembled in Dowell's own shops in Tulsa, Oklahoma, under rigid specifications. It is job-engineered so that you don't have to pay for more equipment than you need. Field maintenance is rigorous.

**DOWELL SERVICES** are versatile, adaptable to any well condition, any size job — big or small. You have a choice of nine basic fracturing services, including water-based, oil-based and acid-based treatments with numerous modifications.

**AS THE PIONEER** of oil well chemical service, Dowell offers a variety of auxiliary services and products that help make fracturing treatments more effective. This variety enables Dowell to provide treatments tailored to current market conditions.

# September wildcat depth breakdown

| | OIL DISCOVERIES | | | | | | | | | GAS DISCOVERIES | | | | | | | | | DRY HOLES | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G | H | I | A | B | C | D | E | F | G | H | I | A | B | C | D | E | F | G | H | I |
| Alabama | | | | | | | | | | | | | | | | | | | | 4 | | | | | | | | |
| Arizona | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | |
| Arkansas | | | | | | | | | | | | | | 1 | | | | | | 3 | 3 | 2 | 2 | | | | | |
| California | | | | | 1 | | 2 | | | | | | | | | | | | 4 | 3 | 8 | 2 | 5 | 3 | 1 | 1 | | |
| Colorado | | | | | 2 | | | | | | 1 | | | | | | | | 5 | | 2 | 9 | 23 | | | | | |
| Florida | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | |
| Illinois | | 2 | 5 | | | | | | | | | | | | | | | | 10 | 26 | 20 | | | | | | | |
| Indiana | 5 | 2 | | | | | | | | | | | | | | | | | 7 | 12 | 1 | | | | | | | |
| Kansas | | | 2 | 2 | 1 | | | | | | | | | | | | | | | 5 | 21 | 22 | 7 | | | | | |
| Kentucky | | 3 | 1 | | | | | | | | | | | | | | | | 5 | 19 | 1 | | | | | | | |
| Louisiana | | | | | 2 | 2 | | | | | | 1 | | | 1 | | | | 1 | 1 | 3 | 2 | 11 | 4 | 11 | 3 | 3 | |
| North | | | | | 2 | 1 | | | | | | 1 | | | 1 | | | | 1 | 1 | 3 | 2 | 11 | 2 | | | | |
| South | | | | | | | | | | | | | | | | | | | | | | | | 2 | 8 | 3 | 3 | |
| Offshore | | | | | | 1 | | | | | | | | | | | | | | | | | | | 3 | | | |
| Michigan | | | | | | | | | | | 1 | | | | | | | | 1 | 4 | 2 | | | | | | | |
| Missouri | | | | | | | | | | 1 | | | | | | | | | | | | | | | | | | |
| Mississippi | | | | | | | 2 | | | | | | | | | | | | | | | 1 | 9 | 2 | 1 | 2 | | |
| Montana | | | | | | | | | | | | | | | | | | | 1 | 5 | 1 | 2 | 1 | | | | | |
| Nebraska | | | | | 3 | | | | | | | | | | | | | | | | | 4 | 20 | 1 | | | | |
| New Mexico | | 1 | | | | | | | | | | | | | | | | | 2 | 5 | 4 | 7 | 3 | 1 | 3 | | | |
| West | | | | | | | | | | | | | | | | | | | 1 | 3 | 1 | 3 | 1 | | | | | |
| East | | 1 | | | | | | | | | | | | | | | | | 1 | 2 | 3 | 4 | 2 | 1 | 3 | | | |
| New York | | | | | | | | | | | | | | | | | | | | | 1 | 1 | | | | | | |
| North Dakota | | | | 1 | 2 | | | | | | | | | | | | | | | | 3 | 2 | 1 | 3 | | | | |
| Ohio | | | | | | | | | | | | | | | | | | | | 1 | | | | | | | | |
| Oklahoma | 1 | 1 | 3 | 1 | 2 | 2 | 4 | | | 1 | | | | | 1 | | | | 12 | 9 | 8 | 10 | 10 | 4 | 2 | | | |
| Pennsylvania | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | |
| South Dakota | | | | | | | | | | | | | | | | | | | | 1 | | 1 | | | | | | |
| Tennessee | | | | | | | | | | 1 | | | | | | | | | 1 | | | | | | | | | |
| Texas | | 1 | 3 | 4 | 13 | 8 | 3 | 1 | | 1 | | 2 | 1 | | 1 | 1 | | | 23 | 67 | 64 | 53 | 59 | 36 | 12 | 1 | 1 | |
| Dist. 1 | | | | | 1 | | | | | | | | | | | | | | 5 | 19 | 9 | 1 | 2 | | | | | |
| Dist. 2 | | | | | | | | | | | | | | | 1 | | | | 1 | | 3 | 2 | 3 | 8 | 2 | | | |
| Dist. 3 | | | | | | 2 | 1 | | | | | | | | | | | | | | | | 7 | 12 | 3 | | | |
| Dist. 4 | | | | | 2 | | | | | | | | | | | | | | 3 | 1 | 6 | 7 | 9 | 6 | 1 | | | |
| East | | | | | | | | | | | | | | | | | | | 3 | 4 | | 8 | 14 | 4 | | | | |
| Dist. 7-B | | 1 | 2 | 2 | 2 | | | | | 1 | | | | | | | | | 5 | 23 | 15 | 15 | 6 | | | | | |
| West | | | 1 | 1 | 3 | 5 | 2 | 1 | | | | | | | | | | | 4 | 10 | 13 | 9 | 6 | 4 | 6 | 1 | | |
| Dist. 9 | | | | 1 | 5 | 1 | | | | | | | 1 | | | | | | 2 | 10 | 14 | 10 | 6 | | | | | |
| Dist. 10 | | | | | | | | | | | | 2 | | | | | 1 | | | | 4 | 1 | 6 | 2 | | | | 1 |
| Utah | | | | | 1 | | | | | | | | | | | | | | | 1 | | 1 | 2 | 1 | 1 | 1 | | |
| Washington | | | | | | | | | | | | | | | | | | | | | | | 1 | | | | | |
| West Virginia | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | |
| Wyoming | | | | | | | | | | | | | | | | | | | 3 | 3 | 2 | 3 | 9 | 7 | | | | |
| **Total United States** | **6** | **10** | **14** | **8** | **27** | **12** | **11** | **1** | | **4** | **2** | **3** | **1** | **2** | **3** | **1** | | | **75** | **170** | **144** | **124** | **164** | **62** | **31** | **8** | **4** | |
| Western Canada | | 2 | 1 | 2 | 1 | | | | | | 3 | | 2 | 1 | 1 | 1 | 1 | | | 4 | 10 | 12 | 9 | 6 | 1 | | | | |
| Alberta | | 1 | 1 | 2 | 1 | | | | | | | | 2 | | 1 | 1 | | | | 2 | 5 | 4 | 4 | 4 | 1 | | | |
| Saskatchewan | | 2 | | | | | | | | | 3 | | | | | | | | | | 5 | 8 | 5 | 1 | | | | |
| Manitoba | | | | | | | | | | | | | | | | | | | | 2 | | | | | | | | |
| British Columbia | | | | | | | | | | | | | | 1 | | | 1 | | | | | | | 1 | | | | |

NOTE: A = 0-1,250 ft.; B = 1,250-2,500 ft.; C = 2,500-3,750 ft.; D = 3,750-5,000 ft.; E = 5,000-7,500 ft.; F = 7,500-10,000 ft.; G = 10,000-12,500 ft.; H = 12,500-15,000 ft.; I = 15,000 ft.

22-month test showed
substantial savings from using

# MISSION MUD MONARCH VALVES

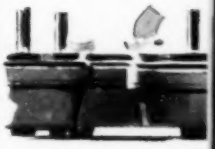
OVER 2400 VALVES AND SEATS were used by a large operator during a 22-month test comparing the cost of Mission Mud Monarch fluid end mud pump valves and seats with the competitive make he was using at the beginning of the test. Due to the size and duration of the test, results may be considered conclusive for the 2500-psi pressures and other conditions encountered.

*This test showed that Mission Mud Monarch Valves and Seats cost less than half as much per thousand feet of hole as the competitive make.*

Why don't you make a competitive test yourself to find out just *how much* Mud Monarch Valves can save *you?* Many operators have reported important savings at normal pump pressures, even though the advantage of using Mud Monarch Valves becomes greater as pressures become higher. Arrange with your Mission Representative for a competitive test.

**COMPETITIVE VALVES**

***cost more than $36 per thousand feet of hole.***



*Nothing but the finest will bear the name of*

MISSION MANUFACTURING CO.

**MUD MONARCH VALVES**

***cost less than $18 per thousand feet of hole!***

Keep your valve costs down—specify Mission Mud Monarch!

*MISSION MANUFACTURING CO. • P. O. Box 4209 • Houston, Texas • Cable Address—"Missco" • Export Office: 30 Rockefeller Plaza, New York*
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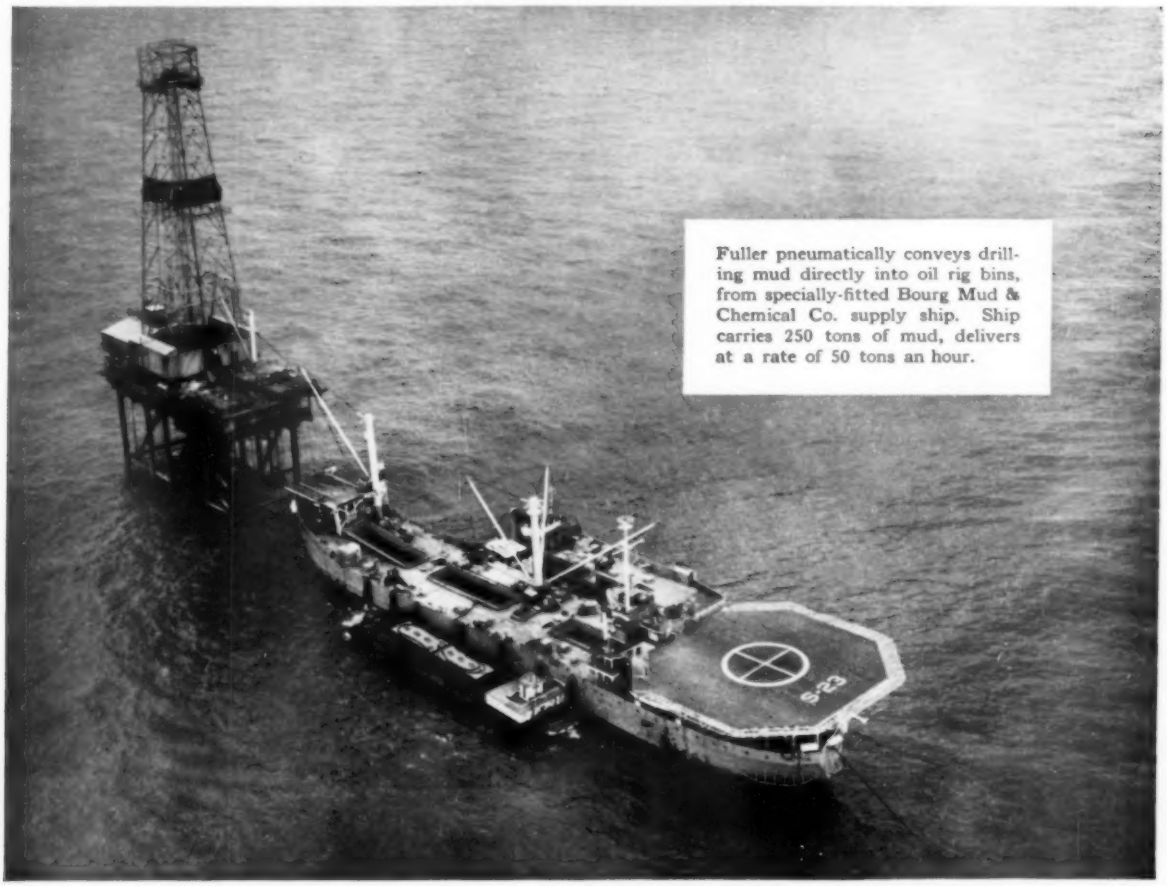
**The Arithmetic of Materials Handling**



Fuller pneumatically conveys drilling mud directly into oil rig bins, from specially-fitted Bourg Mud & Chemical Co. supply ship. Ship carries 250 tons of mud, delivers at a rate of 50 tons an hour.

# Sea-Going Fuller Pneumatic Conveying System Cuts Time and Cost of Vital Drilling-Mud Deliveries

The Bourg Mud & Chemical Co., Inc., of Lockport, La., is making off-shore deliveries of drilling mud by advanced Fuller pneumatic systems.

The dry mud is automatically pumped aboard oil rigs from a Fuller equipped cargo ship at a rate of 50 tons an hour—one man replacing large crews handling 100-pound sacks in cargo nets. Previously, bag handling in high seas had been either dangerous or impossible. The highly flexible bulk-handling system now operates safely and efficiently at all times.

Self-emptying hoppers designed and built by Delta Tank Manufacturing Company installed into the Bourg ship are fitted with F-H Airslide® fluidizing gravity conveyors. A 6-inch Fuller-Kinyon pump transfers the aerated material to bins aboard the rig — over distances up to 300 feet. Air pressure is supplied by a diesel-driven Fuller single-stage vane-type rotary compressor.

Here is a good example of Fuller's engineering experience and wide range of equipment combining to solve your materials handling problem. If you handle large volumes of cement and barite, why not investigate a simple, efficient Fuller pneumatic conveying system? For details, write or call Fuller today outlining your problem.

1311
P-171

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**132 Bridge St., Catasauqua, Pa.**
SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORPORATION
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**Fuller**
....pioneers in harnessing AIR

# "Pipe Dream" Is Coming True

## . . . for W. J. Bowen, president of Coastal Transmission. Florida's big gas demand helped make this venture click.

A FEW weeks ago, at the age of 36, W. J. Bowen became president of a multimillion-dollar pipeline firm, Coastal Transmission Corp.

Actually, he had been named president of the company 2 years earlier, when he was only 34. But at that time Coastal couldn't be classified as a multimillion-dollar corporation. It was just a struggling young firm with a multimillion-dollar idea.

The abrupt transformation came about late in August. Then, through its parent company, Houston Corp., Coastal acquired the necessary public financing to proceed with its pipeline construction plans. The company started immediately to transform its "pipe dream" into a reality (OGJ, Aug. 25, p. 46).

For every major pipeline ever proposed there have been skeptics who thought it would never be built. Coastal had more than its share of these, for sunny Florida was considered an unlikely destination for a natural-gas line.

Convincing the skeptics has been one of Jack Bowen's biggest jobs. He claims little credit, though, for the success which now seems within reach. Much of the convincing was done by such men as F. E. Stanley, Tulsa pipeline contractor and head of Houston Corp.; Theodore Rinehart, Tulsa attorney, who is a director and senior vice president of the parent company; O. Paul Herzig, vice president in charge of engineering; and Leon M. Payne, a director.

Perhaps the greatest sales job was done by gas itself. Demand for gas in Florida already exceeds initial capacity of the line under construction. Before the line is completed, the FPC probably will be asked to approve expansion to about 410,000,000.

Coastal is building only the western segment of the line, from South Texas to a point near Baton Rouge. From there, the line will be built by Houston Texas Gas & Oil Corp. Both companies are subsidiaries of Houston Corp.

**Young veteran . . .** Despite his youth, Bowen is probably Coastal's oldest employe in years of service.

He was named vice president in the summer of 1954, when the company was organized by Delhi Oil Corp., a Clint Murchison firm now known as Delhi-Taylor Oil Corp.

Coastal was organized to move Texas gas to interstate pipelines in Louisiana. But about that time, Stanley reviewed the frequently ridiculed plan to pipe gas to Florida. Coastal and Stanley joined forces.

Bowen remained on the Delhi pay roll at Corpus Christi while helping to organize Coastal. He became president of the new firm in August 1956 following the resignation of John O. Sue, but he didn't move to Coastal headquarters in Houston until February 1957, after the company had received its FPC certificate. He recently became a senior vice president of the parent company.

## ▶ ▶ ▶ Personals

**Military background . . .** W. J. (for William Jackson) Bowen was born March 31, 1922, at Sweetwater, Tex. He grew up at Waco and attended the University of Texas 2 years. After that, he enrolled at the U. S. Military Academy where he received his Bachelor of Science in 1945.

True to West Point tradition, he was married the day after graduation. His bride was Annis Hilty, a Houston girl, who had been "the old college sweetheart" at the University of Texas. They now have three children.

After graduation, Bowen remained on active duty with the Army more than 4 years. Much of this time was spent on Okinawa, where the Bowens' first child was born.

Bowen resigned from the Corps of Engineers in September 1949 and went to work for Delhi as a junior engineer.

At home, Bowen finds relaxation and a degree of acclaim as an oil painter. He describes his hobby as "just the run-of-the-mill, Sunday afternoon painting." His wife thinks enough of his works to display them liberally in their River Oaks home.

**Growing pains . . .** Bowen warms up on talk about Coastal, the subject that has monopolized most of his time in recent years.

"I think we had our share of problems and troubles," he says. "We had a tough time putting together the gas supply because of the Phillips decision and the uncertainty of committing gas to a new pipeline."

Legal problems then arose, holding up construction more than a year. Financing the line also was time-consuming.

"Now that the company is in business, there's a big difference. But our greatest problem today is acquiring new gas for future needs."

●

**Dale O. Cooper,** formerly process design and economics engineer with Union Oil Co., and **Louis P. Karvelas,** formerly engineer with Humble Oil & Refining Co., have joined Bonner & Moore Engineering Associates, Houston consulting firm.

**D. J. Brennan,** geologist for Shell Oil Co., has been transferred to Oklahoma City from Houston. **S. W. McColloch,** junior geologist in Houston, has been promoted to geologist and transferred to Oklahoma City.

*This announcement is not an offer to sell, or a solicitation of an offer to buy these securities. The offering is made only by the Prospectus.*

*NEW ISSUE* *October 16, 1958*

500,000 SHARES

# PAULEY PETROLEUM INC.

COMMON STOCK

*Par Value $1 Per Share*

PRICE $12.50 PER SHARE

*Copies of the Prospectus may be obtained from any of the several underwriters only in States in which such underwriters are qualified to act as dealers in securities and in which the Prospectus may legally be distributed.*

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STONE & YOUNGBERG WILSON, JOHNSON & HIGGINS

**Donald O. Maxwell,** group supervisor in the planning section of the Standard Oil Co. (Ohio) process-engineering division, manufacturing department, has been named head of a new systems-engineering section. The new section will be responsible for development and design of new and improved control systems. It will also act as consultant to Ohio Standard refineries and other technical divisions.

**Merrill L. Nielsen,** geologist with Sinclair Oil & Gas Co., has been transferred to Casper, Wyo., from Grand Junction, Colo.

B. L. **(Barney) Francis,** formerly assistant to the manager of The Texas Co.'s Louisiana division, has been transferred to Houston.

**J. Ed Warren,** new chairman of the executive committee and a director of Cities Service Co., has been elected a director of City Bank Farmers Trust Co., New York.

**Jack C. Swan,** formerly operations supervisor at the Neodesha, Kans., refinery of Standard Oil Co. (Ind.), has been named refinery superintendent at Northwestern Refining Co.'s St. Paul Park, Minn., refinery.

**Gregory K. Elias,** Durango, Colo., consultant, has joined Lion Oil Co. division of Monsanto Chemical Co. in the Salt Lake City production and exploration department. Elias was exploration manager for Turkish Gulf Oil Co. in Ankara, Turkey, before opening consulting offices in Durango earlier this year.

**G. L. Blacksher,** production manager of Skelly Oil Co., has been elected vice president in charge of production. **W. R. Miller** has been elected general auditor for Skelly, and **A. C. Samuelson** becomes assistant general auditor. Blacksher has been with Skelly since 1931. He was named Tulsa area superintendent in 1954 and became production manager last year.

**C. P. Baker,** Sunray Mid-Continent Oil Co.'s area superintendent, development and operations, in Premont, Tex., has been transferred to Alice, Tex., as development foreman. **Paul R. White,** junior engineer for the company in Corpus Christi, Tex., has been promoted to production engineer in Aransas Pass, Tex. **T. P. Harris, Jr.,** junior engineer in Midland, has been promoted to evaluation engineer and transferred to Tulsa.

**Charles O. Hurst,** senior gas engineer with Texas Gas Transmission Corp., has been transferred to Houston from Lake Charles, La.

**John P. McKenzie,** technologist at Shell Chemical Corp.'s Dominguez, Calif., plant, has been transferred to Union, N. J., as a marketing trainee.

**Arlie M. Skov** has been transferred by Sohio Petroleum Co. from Pauls Valley, Okla., to Oklahoma City as engineer.

**Wilbur Rocchio,** formerly executive vice president of McRae Oil & Gas Corp. in Denver, has opened offices as an independent operator in Midland, Tex.

**Sherman A. Peterson,** Bakersfield, Calif., production foreman for Superior Oil Co., will retire November 30 after 40 years in the industry. Peterson joined Keck Drilling Co., forerunner of Superior, in 1918. He moved from drilling to production in 1948.

**Chester L. May,** who recently retired as senior vice president of Lone Star Gas Co., has been elected chairman of the board of Arkla Air Conditioning Corp., subsidiary of Arkansas Louisiana Gas Co. **Robert K. Eskew,** Arkla's director of research, development, and engineering, has been named a vice president of the company.

Tidewater Oil Co. has named 13 new supervisors at its Delaware City, Del., refinery. They include **William J. Doyle,** crude area acting supervisor, and **Raymond K. Arzinger,** technical foreman of the crude area. **Elwood R. Bailey** has been named supervisor of the cracking area and **Lloyd E. Forbes** becomes superintendent of the crude and cracking area. In the coking area, **Clifford A. Phillips** has been named superintendent; **Robert C. Carter** is supervisor, and **Charles H. Bennett** is technical foreman. **E. R. Westfield** is acting supervisor of economic planning and **Eugene Andrechak** is acting superintendent of economic planning and accounting. **Ray Harrison, Jr.,** has been appointed superintendent of the utilities, oil dispatching, and sulfur-recovery area. **Robert E. O'Sullivan** is acting technical foreman of the utilities and sulfur-recovery area. **William H. Graf** has been named staff engineer of the alkylation-polymerization area. **Clarence E. Slater** becomes inspector in the inspection department.

## ▶▶▶ Personals

PETTIT

**A. E. Pettit** has been named district exploration superintendent for Sohio Petroleum Co.'s expanded New Orleans office. The district, which formerly handled only offshore operations, will now cover eastern Louisiana. **S. A. Hatcher** will be district geophysicist. **L. L. Fergus** is district landman. **R. G. Lovick,** senior geologist, will handle onshore, and **W. L. Rader** is senior geologist for offshore. **Walter Wojciechowski,** geologist in Lafayette, La., and **Carl Lockhart,** geologist in Houston, have been transferred to New Orleans. **R. E. Johnson,** Lafayette district superintendent, will be in charge of operations for the New Orleans district. **John H. Atwood** will be New Orleans district representative for operations.

**Horace K. Quattlebaum,** senior engineer in charge of Carter Oil Co.'s Tulsa petroleum engineering section, has been named Carmi, Ill., district engineer for the company. **John F. Richardson** will replace Quattlebaum in Tulsa.

**Otis G. Bryant,** senior engineer with Houston Pipe Line Co., has been promoted to chief engineer. A graduate of Texas Technological College, Bryant joined Houston Natural Gas Corp. in 1949 as a field engineer. He was transferred to Houston Pipe Line, a subsidiary, in 1957.

**J. E. Moise,** assistant director, chemicals, at Esso Standard Oil Co.'s Baton Rouge, La., laboratories, has been transferred to Esso Research & Engineering Co. in Linden, N. J. **Dr. J. A. Polack,** assistant director, personnel and business administration, in Baton Rouge, will succeed Moise. **Dr. L. E. Swabb, Jr.,** section head, replaces Polack. **W. J. Porter, Jr.,** has been named a section head succeeding Swabb.

**Dr. Raymond L. Betts** and **Dr. Robert Scott** have been named research associates by Esso Research & Engineering Co. Betts joined Esso in 1937. He was in the process research division before being moved to information research last year. Scott joined Esso Research in 1942. He is currently on a 6-month assignment with Esso Standard Oil Co.'s marketing department.

# Personals

**C. K. Taylor,** superintendent for Delta Engineering Corp., has been transferred to Jal, N. M., from Continental Divide, N. M.

**Wallace M. O'Reilly,** senior petroleum engineer with Humble Oil & Refining Co., has been transferred to Midland, Tex., from Houston.

**Jesse T. Nutter,** Midstates Oil Corp. district production foreman, has been transferred to Oklahoma City from Seminole, Okla.

**Everett T. Reed,** formerly Los Angeles consulting geologist, is now resident geologist for Iran Oil Co., a subsidiary of National Iranian Oil Co., in the new Qum oil area in central Iran.

**M. S. Johnson,** former Casper, Wyo., district geologist for Amerada Petroleum Corp., has joined Apache Oil Corp. as head of the company's new Denver exploration office.

**Flint Agee** has been named manager of North American operations for United Geophysical Corp. Agee, a director of the company, has been with United since 1943. **William P. Patterson** has joined United as vice president and general manager of United Electro-Dynamics, a division of the corporation. **Frederic K. Van Biene** has been named manager of United Testing laboratories, another division.

**W. F. Allmon,** mechanical engineer in Woodward, Okla., for Shell Oil Co., has been promoted to district mechanical engineer. He succeeds **Frank Poorman, Jr.,** who has joined Shell Development Co. in Houston. **C. R. Reiter,** district mechanical engineer in Great Bend, Kans., has been transferred to the North Texas division in Wichita Falls as mechanical engineer. **W. J. Fairbanks,** formerly mechanical engineer in Wichita Falls, has moved to the Pacific Coast area. In other changes, Shell has transferred **J. B. Brooks,** exploitation engineer in Ardmore, Okla., to Oklahoma City. **J. D. Sweet,** formerly on assignment with Shell Oil Co. of Canada, Ltd., has moved to Oklahoma City as exploitation engineer. **C. H. Stewart,** exploitation engineer in Great Bend, Kans., has been named reservoir engineer in Centralia, Ill. **W. E. McCool,** reservoir engineer in Centralia, has been named exploitation engineer there. **J. A. Bailey** has joined Shell in Tulsa as junior exploitation engineer.

**John D. Traut,** geologist with Ohio Oil Co., has been transferred to Billings, Mont., after a 2-year assignment in Guatemala.

**Robert M. Morgan,** formerly foreman in Tioga, Watford City, and Belfield, N. D., for Amerada Petroleum Corp., has been transferred to Williston, N. D., in the same capacity.

**Ward E. Kuentzel,** group leader at the Whiting, Ind., research laboratories of Standard Oil Co. (Ind.), has retired. Kuentzel joined Indiana Standard in 1930. He holds several patents in the field of high-pressure reaction research. **Dr. Ti-Kang Kwei,** formerly with Plastic Film Corp., has joined the company's Whiting lab. He will specialize in petrochemical research.

A. F. BARRETT

**A. F. Barrett,** vice president in charge of production for Mobil Producing Co., has moved up to vice president and general manager of the company. **E. C. Cram,** president of Mobil Producing, has been transferred from Billings, Mont., to the New York office of Socony Mobil Oil Co., the parent company. In other Mobil Producing changes, **C. E. Carlson,** Billings district geologist, has moved to Casper, Wyo., in the same capacity. He succeeds **E. Philip Andrews,** who has resigned to become a consultant. Carlson will be succeeded in Billings by **R. N. Grinnel,** formerly of Casper. **Porter Mitchell,** geologist in Bismarck, N. D., has been transferred to Billings.

**Dr. William Schriever,** University of Oklahoma professor, has been awarded honorary membership in the Society of Exploration Geophysicists. Schriever began the first course in geophysics at Oklahoma in 1929. He was cited for "scholarly contributions in teaching, research, and scientific papers" by SEG.

**Joseph L. Burden,** acting president of Bell & Burden, Inc., Los Angeles drilling firm, has been elected president. He succeeds the late A. H. (Ham) Bell. **H. A. Buchanan,** vice president and manager of operations, has been named executive vice president and secretary. Also, **John Kerfoot** becomes vice president and treasurer, and **D. J. Murray** becomes assistant secretary. Burden, Buchanan, Kerfoot, and Murray will constitute the company's board of directors.

Appointed project chemical engineers at the Whiting, Ind., research laboratories of Standard Oil Co. (Ind.) are **Richard A. Ahlbeck, William M. Herring, Jr., Frederick E. Mueller, William C. Taylor, Jr.,** and **Ralph G. Zelmer.**

**W. L. Smith,** field petroleum engineer in Tulsa for Olin Oil & Gas Corp., has been promoted to division petroleum engineer. He succeeds **W. V. Rogers,** who has been transferred to Monroe, La. Smith has been with the company since 1954.

**Charles F. Blankenhorn,** Denver division reservoir engineer for Shell Oil Co., has been named area reservoir engineer. He succeeds **Arnold Hols,** who has been transferred to Cia. Shell de Venezuela. **Franklin T. Bethel,** reservoir engineer in Denver, will succeed Blankenhorn as division reservoir engineer. Also, **Marshall E. Welbourn,** petrophysical engineer in Shell's Billings, Mont., division, has been transferred to Denver as exploitation engineer.

**T. L. White,** Youngstown, Ohio, consultant, has been named chairman and head of the executive committee of the petroleum division of American Society of Mechanical Engineers. Other division officers are **J. P. Mooney,** Humble Oil & Refining Co., vice chairman; and **Allen F. Rhodes,** McEvoy Co., secretary. **G. W. Lunsford,** Dow Chemical Co., has been named to the executive committee. Rhodes and Mooney are also executive committee members. Appointed petroleum division general committee chairmen were **G. L. Farrar,** The Oil and Gas Journal, press committee; **J. E. Green,** Shell Pipe Line Co., transportation committee; **W. O. Long,** Fluor Corp., refining-gas products-petrochemical committee; **T. V. Miller,** Humble Oil & Refining Co., drilling and production; **G. E. Nevill,** Cameron Iron Works, Inc., materials; **H. Lee Norris, Jr.,** Kinzbach Tool Co., manufacturers committee; **Earl Seaton,** Oil and Gas Equipment, news; **H. H. Meredith, Jr.,** Humble Oil & Refining Co., advisory committee; **L. J. Powers,** Texas Technological College, student committee; and **R. O. Wynn,** ACF Industries, section-division arrangements. Also appointed to the general committee are **P. E. Frank,** Sinclair Oil Corp., professional divisions associate; **Frank L. Evans,** Petroleum Refiner, publicity secretary; **E. J. Hander,** Asiatic Petroleum Corp., research secretary; and **J. W. Young,** Humble Oil & Refining Co., reporting representative, annual meeting.

**C. Scott Parker,** formerly a student at the University of Texas, has joined The Texas Co. as an engineer in Manvel, Tex.

**William E. Brigham,** formerly instructor in chemical engineering at the University of Oklahoma, has joined Continental Oil Co.'s production research division as research engineer.

**G. W. Ferguson,** formerly at The Texas Co.'s Beacon, N. Y., research center, has been named technologist in the Los Angeles office of Texaco's research and technical department.

**Frank Nicholson, Jr.,** former junior engineer with Sun Oil Co. in Dallas, has returned to the company after military service. He will be junior petroleum engineer in Rockport, Tex.

**John W. Gaylord,** technical assistant to the manager of process research for California Research Corp., has been named senior staff specialist, nuclear energy. He will headquarter at the Richmond, Calif., laboratory.

**Dr. Robert F. Bremer**, formerly project leader with Dow Chemical Co., has been appointed chief research chemist for Leonard Refineries, Inc. **Philip Purcell** has been named research chemist for Leonard, and **Paul Mernitz** becomes head of technical services.

**Howard A. Johnson,** production geologist with Shell Oil Co., has been transferred to Houston from New Orleans.

**G. R. Shiarella, Jr.,** has joined the petroleum department of First National City Bank of New York as petroleum engineer. He was formerly exploitation engineer for Shell Oil Co. in Denver.

**W. E. Boyd,** Gulf Oil Corp.'s Houston production division drilling engineer, has been named southern district superintendent for British-American Oil Producing Co. in Houston. He succeeds **Gordon J. Buckle.**

**J. D. Burns,** process engineer in Ponca City, Okla., for Continental Oil Co., has been transferred to Gretna, La., as process engineer at the company's petrochemical plant there. Burns joined Conoco as a chemical engineer in Ponca City in 1955. He is a graduate of Rice Institute.

**L. E. Buzarde, Jr.,** has joined Stekoll Petroleum Corp. as geologist for Canadian operations and log analyst. **Jim Urice,** geologist, has also been assigned to Canada. **Jack Hinckley** has joined the company as engineer in charge of Stekoll properties in the Texas Panhandle field. **A. D. Barnes, Jr.,** has joined Stekoll as supervisor of West Texas operations.

## ▶ ▶ ▶ Personals

**Dr. Charles F. Cook** has joined Phillips Petroleum Co. as manager of the new radiation laboratories in Bartlesville, Okla.

**J. T. Collins,** reservoir engineer in Houston for Gulf Oil Corp., has been promoted to production foreman in Hull, Tex.

**Dewitt H. Hunter,** chief deliveryman for Cherokee Pipe Line Co. in Wood River, Ill., has been transferred to Sulphur, La., as assistant superintendent of deliveries for Cities Service Pipe Line Co.

**Dr. Robert H. Perry** has resigned as project engineer with Scientific Design Co. to become an associate professor of Chemical Engineering at the University of Oklahoma and process design consultant.

**P. S. P. Fell,** New York representative for Gulf Oil Corp.'s foreign crude oil sales department, has been named New York representative, crude oil department. **R. C. Arnold,** foreign crude oil sales department representative in Rio de Janeiro, Brazil, has been named South American representative, crude oil department. He will continue to headquarter in Rio.

## ▶ ▶ ▶ Deaths

**David Donoghue,** 67, Fort Worth consulting geologist and engineer, died October 15 in Mexico City, apparently of a heart attack. He was to have returned from his Mexican business trip October 20. Donoghue finished studies in mining engineering and geology at St. Mary's College, San Antonio, Tex., and the University of Texas in 1912. He was with J. M. Guffey Petroleum Corp. (a Gulf Oil forerunner) and Maryland Oil Co. of Texas at one time. In 1921 he resigned as chief geologist of Texas Pacific Coal & Oil Co. to set up as a consultant. In recent years his work took him all over the world. He spent 8 months this year in Tunisia, Libya, and Malta as a petroleum adviser under United Nations sponsorship. Donoghue was a charter member of the Fort Worth Geological Society and its second president. He served for many years as chairman of the important unitization committee of Texas Independent Producers and Royalty Owners Association.

**Fred Smith, Jr.,** 78, retired southern division sales manager for D-X Sunray Oil Co., died October 17 in a Tulsa hospital. Smith joined the old Cosden Oil Co., forerunner of D-X Sunray, in 1917. He retired in 1953.

**Donald B. Wines,** 57, Tulsa division geologist for Midstates Oil Corp. before its recent sale to Tennessee Gas Transmission Corp., died October 17 in a Wichita hospital. Wines was supervising the opening of a new TGT office in Wichita. A graduate of the University of Michigan, Wines joined Phillips Petroleum Co. in Bartlesville, Okla., in 1929.

**Glenn Mannes,** 48, Holland, Mich., president of Ford Oil Co. and director of the Oil and Gas Association of Michigan, died October 15 after an illness of several months.

**Bennett B. Anderson,** 41, chief landman for Union Oil & Gas Corp. of Louisiana, died recently. Anderson was with Republic Production Co. before joining Union in 1954.

**James Hamilton Green,** retired stationary engineer for Shell Oil Co., died October 13 at his home in Bakersfield, Calif.

**Edwyn Clay Lloyd,** 62, oil editor of the Los Angeles Examiner, died October 16 after a long illness. Lloyd joined the Examiner in 1941. He was with California Oil World and National Oil Derrick before that time.

**Frederic I. Chace,** 50, supervisor of crude-oil purchases and sales for The Texas Co., died October 20 at Wilton, Conn. He served in the company's foreign operations department from 1945 to 1955.

**Robert Eugene Dixon,** 48, drilling superintendent for Panhandle Eastern Pipe Line Co., died October 18 in Liberal, Kans., after a heart attack.

▶ ▶ ▶ Statistical Section

# Erratic demand hits product prices

BY JOHN C. CASPER
Economics Editor

NOVEMBER is the big-change month of the last quarter. November demand shifts sharply by products and by years. Rapid changes in demand can cause inventory problems. Abnormal inventories will influence both prices and product movement.

Domestic demand for petroleum products is higher in November than in October. This October-November increase has averaged 6.26% since the end of World War II, but this average is of little value in predicting November demand for a given year. Annual changes have ranged from a decrease of 1.8% in 1952 to an increase of 15.7% in 1955.

November domestic demand has dropped below October for only one year in the postwar period. That was in 1952. But, the chart shows the lack of pattern for increases.

For the 12-year period domestic-demand increases have averaged 2.80% for October over September, 6.26% for November over October, and 8.64% for December over November. Despite the larger over-all increase in December, November still is the big-change month for the quarter.

Gasoline demand drops off more in November than in December, and middle distillates show larger gains. Demand for minor products decreases in the last quarter. The postwar average shows a drop of 6.5% in November and 3.2% in December.

Residual-fuel demand has moved counter to the over-all trend with gains averaging 10.9% in November against 12.9% for December.

## A quick look at the highlights . . .

| | LATEST WEEK | Change from WEEK AGO | | Change from YEAR AGO | |
|---|---|---|---|---|---|
| Production | 6,904,925 | UP | 19,125 | UP | 78,482 |
| Crude stocks | 252,285,000 | UP | 1,958,000 | DOWN | 32,593,000 |
| Completions | 1,031 | UP | 100 | DOWN | 69 |
| Refinery runs | 7,613,000 | DOWN | 110,000 | DOWN | 248,000 |
| Gasoline stocks | 170,361,000 | DOWN | 2,553,000 | DOWN | 8,902,000 |
| Kerosine stocks | 31,520,000 | UP | 156,000 | DOWN | 3,492,000 |
| Distillate stocks | 161,341,000 | UP | 2,599,000 | DOWN | 12,444,000 |
| Residual stocks | 68,020,000 | DOWN | 976,000 | UP | 9,197,000 |
| Four-product stocks | 431,242,000 | DOWN | 774,000 | DOWN | 15,641,000 |
| Total imports | 1,520,300 | UP | 11,100 | DOWN | 18,500 |

These irregular but sharp changes in demand for November have made it a critical month for the refiner. How should he plan his gasoline stocks? Gasoline demand for November 1955 was as high as it was in October. For 1957, there was a drop of 260,000 bbl. daily between these months.

The largest November gain in distillate demand also came in 1955 when the increase was 741,000 bbl. daily.

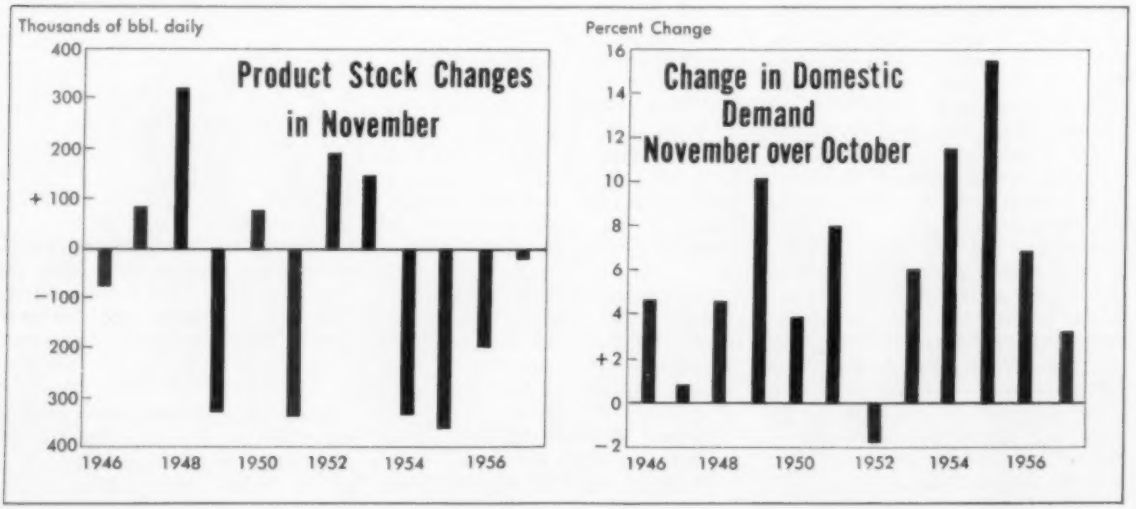
**Pressure on markets . . .** The uncertainty of end-of-the-season gasoline demand is showing up in lower gasoline prices. Not all of the softness in gasoline market can be charged to excessive inventories. The total of 170,361,000 bbl., reported for October 17, was below both last year and the year before.

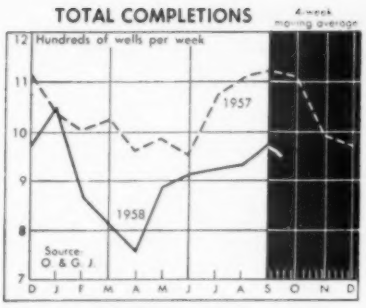
On the East Coast, Esso Standard Oil Co. adjusted its gasoline prices with decreases ranging up to 1.0 cent a gallon. Some upward adjustments were made in depressed price-war areas.

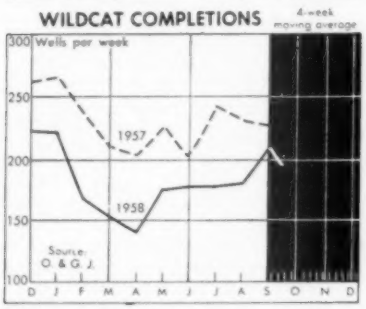
Other marketers announced reductions in gasoline tank-wagon prices both on the East Coast and inland.

Published prices for Group 3 gasoline dropped 0.375 cent a gallon, reflecting soft spot-market prices that have been reported for weeks. It will take several days to measure the effect of this cut on current spot sales. Some deliveries are being made on prior sales at discounts off published prices.

Formal gasoline quotations have not changed on the Gulf Coast but the market is definitely weak. Some marketers hesitate to guess how low the price would be on a spot cargo.






# Active Rotary Rigs*

| | 10-20-58 | 10-13-58 | 10-21-57 |
|---|---|---|---|
| Alabama | 11 | 9 | 5 |
| Arkansas | 24 | 22 | 30 |
| Arizona | 2 | 2 | 1 |
| California | 71 | 71 | 87 |
| Colorado | 37 | 42 | 56 |
| Florida | 1 | 1 | 1 |
| Georgia | | | |
| Idaho | | | |
| Illinois | 60 | 59 | 47 |
| Indiana | 10 | 13 | 7 |
| Iowa | 3 | 3 | 2 |
| Kansas | 142 | 144 | 155 |
| Kentucky | 7 | 11 | 8 |
| Louisiana | 296 | 300 | 427 |
| North | 36 | 37 | 56 |
| South | 227 | 228 | 284 |
| Offshore | 33 | 35 | 87 |
| Maryland | 1 | | 1 |
| Michigan | 13 | 9 | 11 |
| Missouri | 1 | 1 | |
| Montana | 28 | 23 | 38 |
| Mississippi | 58 | 51 | 43 |
| Nebraska | 24 | 21 | 24 |
| Nevada | | | |
| New Mexico | 99 | 92 | 144 |
| New York | 2 | 2 | |
| North Dakota | 32 | 30 | 37 |
| Ohio | 2 | 3 | 1 |
| Oklahoma | 233 | 213 | 240 |
| Oregon | | | 1 |
| Pennsylvania | 8 | 9 | 13 |
| South Dakota | 1 | 1 | 1 |
| Texas | 745 | 737 | 859 |
| South-Gulf | 165 | 153 | 173 |
| Offshore | | | 4 |
| North-East | 166 | 170 | (†) |
| West Central | 249 | 252 | (†) |
| West | 165 | 162 | (†) |
| Tennessee | | | |
| Utah | 41 | 36 | 62 |
| Washington | | 1 | 1 |
| West Virginia | 3 | 4 | 3 |
| Wyoming | 63 | 62 | 78 |
| Virginia | | | |
| Total U. S. | **2,018** | 1,972 | 2,383 |
| Western Canada | 140 | 154 | 181 |
| Eastern Canada | 3 | 3 | 3 |
| Grand total | 2,161 | 2,129 | 2,567 |

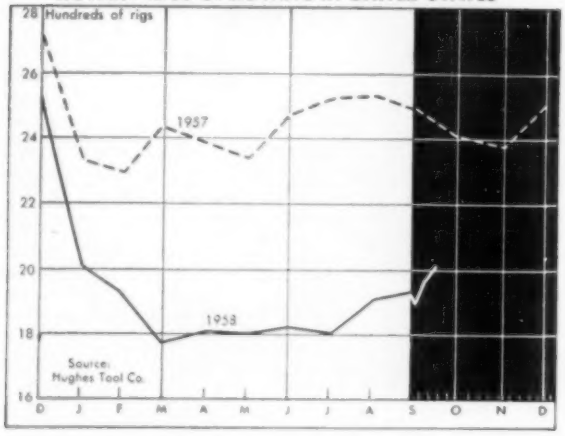
*Hughes Tool Co. †Comparisons not available due to change in method of reporting.

## WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 18, 1958

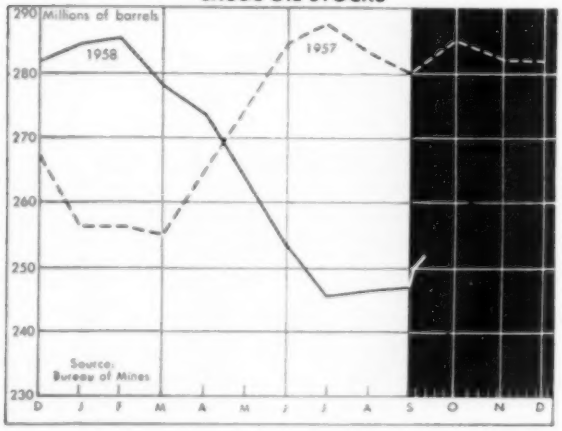
| | Total wells | | | | | | | Cumulative | | Total wildcats | | | | | Cumulative | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total | Crude | Cond. | Gas | Dry | Service | Footage | 1958 | 1957 | Total | Crude | Cond. | Gas | Dry | 1958 | 1957 |
| Alabama | 1 | 0 | 0 | 0 | 1 | 0 | 1,664 | 62 | 67 | 1 | 0 | 0 | 0 | 1 | 24 | 21 |
| Arkansas | 22 | 15 | 0 | 1 | 6 | 0 | 79,201 | 623 | 889 | 5 | 0 | 0 | 1 | 4 | 132 | 166 |
| California | 25 | 14 | 0 | 0 | 11 | 0 | 130,539 | 1,230 | 1,758 | 7 | 1 | 0 | 0 | 6 | 296 | 425 |
| Colorado | 22 | 5 | 0 | 3 | 14 | 0 | 129,579 | 660 | 686 | 13 | 2 | 0 | 0 | 11 | 386 | 452 |
| Illinois | 60 | 25 | 0 | 8 | 27 | 0 | 119,432 | 1,803 | 2,127 | 9 | 2 | 0 | 0 | 7 | 361 | 504 |
| Indiana | 23 | 6 | 0 | 0 | 17 | 0 | 37,954 | 637 | 526 | 10 | 1 | 0 | 0 | 9 | 235 | 106 |
| Kansas | 74 | 31 | 0 | 5 | 37 | 1 | 262,518 | 3,045 | 3,380 | 18 | 3 | 0 | 0 | 15 | 644 | 676 |
| Kentucky | 40 | 10 | 0 | 8 | 22 | 0 | 69,674 | 952 | 1,208 | 3 | 0 | 0 | 0 | 3 | 125 | 244 |
| Louisiana | 74 | 37 | 4 | 1 | 32 | 0 | 605,833 | 2,749 | 3,085 | 13 | 0 | 1 | 0 | 12 | 405 | 551 |
| North | 26 | 11 | 0 | 1 | 14 | 0 | 83,622 | 1,035 | 1,134 | 4 | 0 | 0 | 0 | 4 | 171 | 154 |
| South | 42 | 22 | 3 | 0 | 17 | 0 | 456,532 | 1,367 | 1,404 | 9 | 0 | 1 | 0 | 8 | 211 | 327 |
| Offshore | 6 | 4 | 1 | 0 | 1 | 0 | 65,679 | 347 | 547 | 0 | 0 | 0 | 0 | 0 | 23 | 70 |
| Michigan | 7 | 3 | 0 | 1 | 2 | 1 | 14,845 | 344 | 341 | 2 | 0 | 0 | 0 | 2 | 112 | 123 |
| Mississippi | 4 | 1 | 0 | 0 | 3 | 0 | 25,352 | 305 | 307 | 2 | 0 | 0 | 0 | 2 | 140 | 161 |
| Montana | 5 | 3 | 0 | 0 | 2 | 0 | 26,981 | 264 | 336 | 3 | 1 | 0 | 0 | 2 | 107 | 132 |
| Nebraska | 20 | 10 | 0 | 0 | 10 | 0 | 119,096 | 575 | 722 | 8 | 3 | 0 | 0 | 5 | 267 | 397 |
| New Mexico | 44 | 18 | 0 | 14 | 12 | 0 | 209,345 | 1,553 | 1,742 | 5 | 0 | 0 | 0 | 5 | 213 | 226 |
| West | 27 | 9 | 0 | 13 | 5 | 0 | 113,356 | 761 | 736 | 1 | 0 | 0 | 0 | 1 | 88 | 88 |
| East | 17 | 9 | 0 | 1 | 7 | 0 | 95,989 | 792 | 1,006 | 4 | 0 | 0 | 0 | 4 | 125 | 138 |
| New York | 9 | 4 | 0 | 0 | 0 | 5 | 12,157 | 438 | 372 | 0 | 0 | 0 | 0 | 0 | 39 | 7 |
| North Dakota | 16 | 10 | 0 | 0 | 6 | 0 | 86,351 | 370 | 228 | 4 | 0 | 0 | 0 | 4 | 118 | 103 |
| Ohio | 26 | 13 | 0 | 7 | 5 | 1 | 62,137 | 821 | 896 | 0 | 0 | 0 | 0 | 0 | 12 | 13 |
| Oklahoma | 106 | 69 | 4 | 1 | 28 | 4 | 393,670 | 5,073 | 5,156 | 13 | 1 | 0 | 0 | 12 | 695 | 603 |
| Pennsylvania | 35 | 9 | 0 | 9 | 8 | 9 | 123,640 | 473 | 517 | 2 | 0 | 0 | 0 | 2 | 16 | 39 |
| Texas | 375 | 195 | 12 | 15 | 138 | 15 | 1,522,887 | 14,324 | 17,540 | 74 | 3 | 3 | 1 | 67 | 2,932 | 4,184 |
| Dist. 1 | 18 | 6 | 0 | 1 | 11 | 0 | 67,308 | 795 | 993 | 9 | 1 | 0 | 0 | 8 | 317 | 342 |
| Dist. 2 | 17 | 6 | 3 | 3 | 5 | 0 | 102,122 | 603 | 613 | 3 | 0 | 0 | 0 | 3 | 160 | 212 |
| Dist. 3 | 26 | 6 | 4 | 1 | 15 | 0 | 182,600 | 1,014 | 1,362 | 8 | 0 | 2 | 1 | 5 | 227 | 383 |
| Dist. 4 | 17 | 1 | 3 | 3 | 10 | 0 | 106,815 | 926 | 1,135 | 6 | 0 | 0 | 0 | 6 | 278 | 368 |
| East | 15 | 9 | 0 | 0 | 6 | 0 | 55,639 | 979 | 1,091 | 4 | 0 | 0 | 0 | 4 | 272 | 315 |
| Dist. 7-B | 65 | 34 | 0 | 0 | 27 | 4 | 159,291 | 1,962 | 2,395 | 12 | 1 | 0 | 0 | 11 | 542 | 816 |
| West | 93 | 71 | 0 | 0 | 21 | 1 | 469,303 | 4,097 | 4,959 | 8 | 0 | 0 | 0 | 8 | 573 | 708 |
| Dist. 9 | 83 | 33 | 0 | 4 | 36 | 10 | 214,913 | 2,897 | 3,832 | 15 | 0 | 0 | 0 | 15 | 465 | 951 |
| Dist. 10 | 41 | 29 | 2 | 3 | 7 | 0 | 164,896 | 1,051 | 1,160 | 9 | 1 | 1 | 0 | 7 | 98 | 89 |
| Utah | 8 | 3 | 1 | 0 | 4 | 0 | 47,225 | 302 | 182 | 5 | 0 | 1 | 0 | 4 | 73 | 91 |
| West Virginia | 20 | 5 | 0 | 13 | 2 | 0 | 52,319 | 594 | 552 | 0 | 0 | 0 | 0 | 0 | 14 | 27 |
| Wyoming | 11 | 1 | 0 | 1 | 9 | 0 | 39,824 | 604 | 684 | 10 | 1 | 0 | 0 | 9 | 190 | 239 |
| Misc. (Ariz., S.D.) | 4 | 0 | 0 | 0 | 4 | 0 | 9,662 | 78 | 112 | 4 | 0 | 0 | 0 | 4 | 68 | 95 |
| Total U. S. | **1,031** | 487 | 21 | 87 | 400 | 36 | 4,181,855 | 37,879 | 43,413 | **211** | 18 | 5 | 2 | 186 | 7,604 | 9,585 |
| Previous week | 931 | 472 | 17 | 60 | 356 | 26 | 3,675,551 | | | 197 | 19 | 1 | 2 | 175 | | |
| Cum. 1958 | 37,879 | 18,477 | 905 | 2,879 | 14,603 | 1,015 | 156,208,746 | | | 7,604 | 742 | 130 | 205 | 6,527 | | |
| Western Canada | 45 | 33 | 0 | 1 | 11 | 0 | 211,322 | 1,955 | 2,461 | 7 | 0 | 0 | 1 | 6 | 520 | 697 |

## PRODUCTION

### ROTARY RIGS OPERATING IN UNITED STATES




### CRUDE-OIL STOCKS




### CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

| | 10-11-58 | 10-4-58 | 10-12-57 |
|---|---|---|---|
| Pennsylvania | 2,837 | 2,899 | 3,084 |
| Other Appalachian | 1,867 | 1,432 | 1,861 |
| Illinois, Indiana, Michigan | 9,407 | 9,919 | 11,214 |
| Nebraska and North Dakota | 3,150 | 2,376 | 3,519 |
| Kansas | 9,147 | 9,478 | 10,411 |
| Oklahoma | 16,873 | 16,632 | 20,749 |
| Arkansas | 1,879 | 1,897 | 2,457 |
| Louisiana | 16,974 | 16,238 | 19,737 |
| North | 2,911 | 3,028 | 3,126 |
| South | 14,063 | 13,210 | 16,611 |
| Mississippi, Alabama, Florida | 2,534 | 2,513 | 2,681 |
| New Mexico | 7,980 | 7,464 | 10,043 |
| Texas | 106,304 | 107,047 | 126,464 |
| East Texas | 7,874 | 8,171 | 9,769 |
| West Texas | 52,213 | 52,153 | 59,614 |
| Texas Gulf | 19,840 | 19,578 | 24,854 |
| Other Texas | 26,377 | 27,145 | 32,227 |
| Wyoming | 13,622 | 13,274 | 15,634 |
| Other Rocky Mountain | 9,653 | 9,353 | 5,973 |
| California | 34,093 | 34,387 | 32,247 |
| Foreign | †15,965 | 15,418 | 17,240 |
| Total | **252,285** | 250,327 | 283,314 |

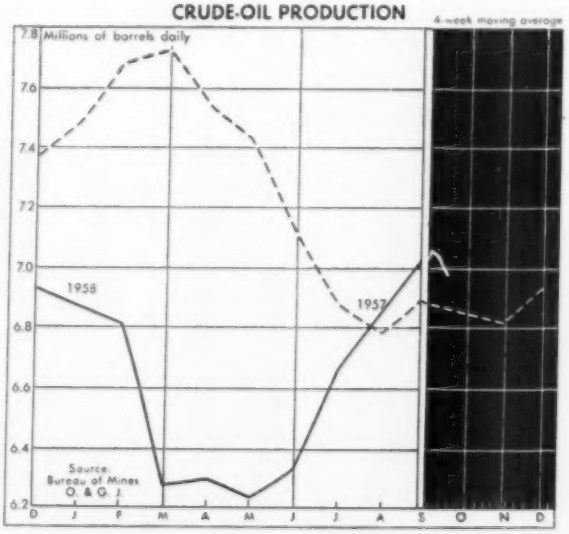
*Bureau of Mines. †Includes 5,460,000 bbl. in California.

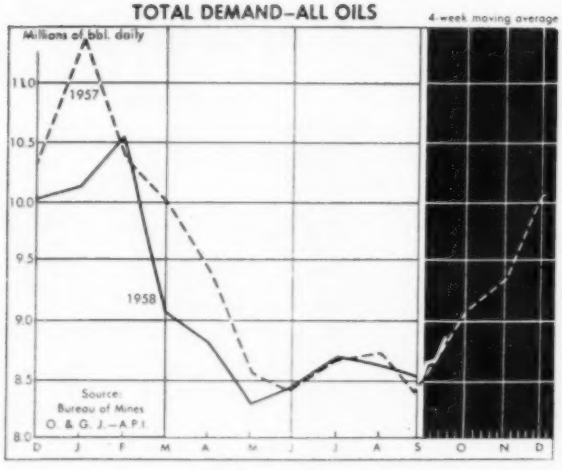
### DAILY AVERAGE PRODUCTION FOR WEEK

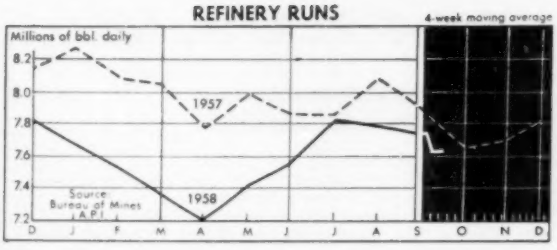
| | October 18, 1958 | | | Oct. 11 |
|---|---|---|---|---|
| | Lease Crude oil | condensate | Total | total |
| Alabama | 16,250 | | 16,250 | 16,275 |
| Arkansas | 74,525 | 150 | 74,575 | 74,750 |
| California | 850,800 | | 850,800 | 853,500 |
| Colorado | 130,900 | | 130,900 | 130,500 |
| Eastern | 46,000 | | 46,000 | 47,300 |
| Florida | 1,200 | | 1,200 | 1,200 |
| Illinois | 230,600 | | 230,600 | 226,900 |
| Indiana | 33,300 | | 33,300 | 33,100 |
| Kansas | †335,675 | | †335,675 | ‡326,500 |
| Kentucky | 41,900 | | 41,900 | 43,700 |
| Louisiana | 809,750 | 89,900 | 899,650 | 897,000 |
| North | 109,750 | 3,500 | 113,250 | 110,600 |
| South | 700,000 | 86,400 | 786,400 | 786,400 |
| Michigan | 26,900 | | 26,900 | 24,500 |
| Mississippi | 105,100 | 4,400 | 109,500 | 109,500 |
| Montana | 77,400 | | 77,400 | 77,800 |
| Nebraska | 57,500 | | 57,500 | 58,000 |
| Nevada | 100 | | 100 | 100 |
| New Mexico | 277,100 | 6,000 | 283,100 | 283,100 |
| North Dakota | 11,500 | | 11,500 | 11,000 |
| Oklahoma | †560,400 | | †560,400 | †555,100 |
| Texas | 2,620,000 | 63,200 | 2,683,200 | 2,683,200 |
| Dist. 1 | 47,000 | 500 | 47,500 | 47,500 |
| Dist. 2 | 116,000 | 8,300 | 124,300 | 124,300 |
| Dist. 3 | 342,000 | 31,000 | 373,000 | 373,000 |
| Dist. 4 | 194,000 | 7,800 | 201,800 | 201,800 |
| Dist. 5 | 31,000 | 400 | 31,400 | 31,400 |
| Dist. 6 | 120,000 | 6,800 | 126,800 | 126,800 |
| East Texas Field | 149,000 | | 149,000 | 149,000 |
| Dist. 7-B | 144,000 | 50 | 144,050 | 144,050 |
| Dist. 7-C | 138,000 | 4,050 | 142,050 | 142,050 |
| Dist. 8 | 1,022,000 | 2,000 | 1,024,000 | 1,024,000 |
| Dist. 9 | 210,000 | 1,500 | 211,500 | 211,500 |
| Dist. 10 | 107,000 | 800 | 107,800 | 107,800 |
| Utah | 104,800 | | 104,800 | 105,400 |
| Wyoming | 329,500 | | 329,500 | 327,200 |
| Others | ‡175 | | ‡175 | ‡175 |
| Total U. S. | 6,741,275 | 163,650 | **6,904,925** | 6,885,800 |
| Change from previous week, up | | | **19,125** | |
| Canada | †458,700 | | †458,700 | †427,400 |
| Total U. S. production—Jan. 1-Oct. 18 | | | 1,922,338,875 bbl. | |
| Same period last year (crude plus cond.) | | | *2,108,691,678 bbl. | |

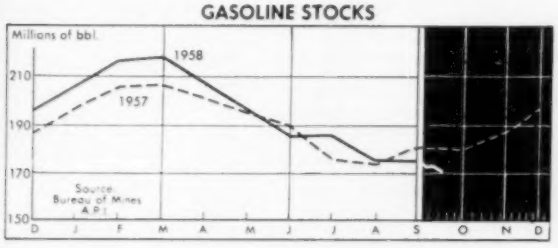
*Includes 40,638,165 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Washington.

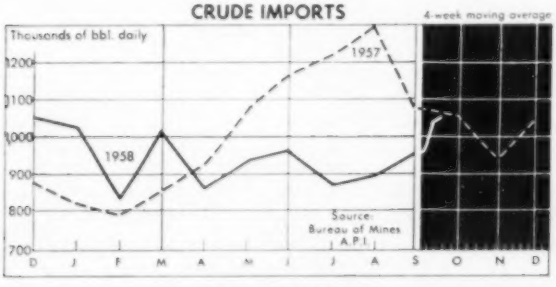
### CRUDE-OIL PRODUCTION

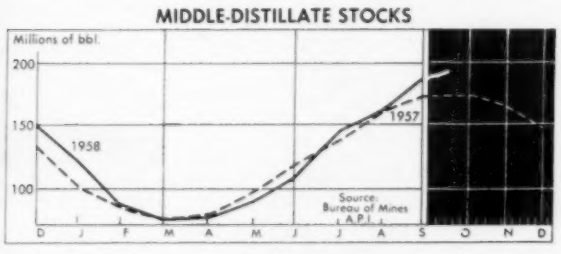


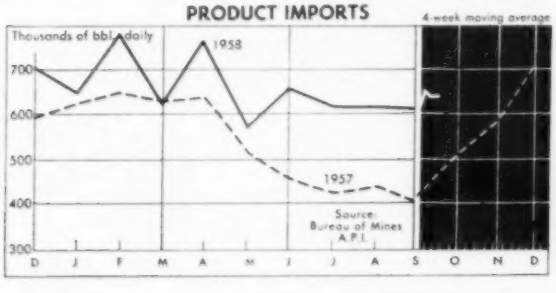


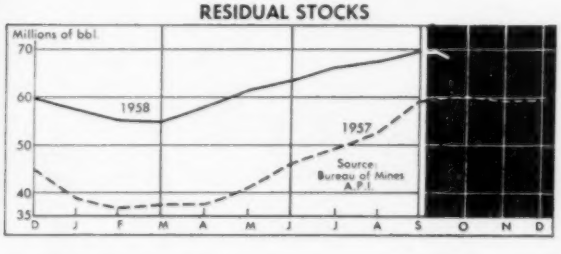




## API REFINERY REPORT, OCTOBER 17, 1958

(Thousands of barrels)

| District— | Daily avg. runs | Daily average production—Gaso.* | Kero. | Dist. | Resid. | Stocks‡—Gaso.† | Kero. | Dist. | Resid. | Bureau of Mines, October 1957—Daily avg. runs | Daily average production—Gaso.* | Kero. | Dist. | Resid. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East Coast | 1,008 | 469.7 | 30.9 | 340.4 | 171.7 | 40,210 | 11,809 | 58,146 | 13,089 | 1,088 | 487.2 | 24.5 | 306.7 | 166.6 |
| Appalachian: | | | | | | | | | | | | | | |
| Dist. 1 | 96 | 41.7 | 3.7 | 21.4 | 14.0 | 4,541 | 600 | 3,792 | 334 | 108 | 46.8 | 4.6 | 23.9 | 8.7 |
| Dist. 2 | 104 | 45.3 | 9.7 | 15.2 | 10.0 | 2,284 | 580 | 1,482 | 195 | 109 | 54.8 | 5.6 | 17.9 | 11.5 |
| Ind., Ill., Ky. | 1,363 | 662.4 | 82.4 | 280.4 | 178.2 | 30,435 | 7,881 | 28,424 | 5,612 | 1,367 | 730.5 | 69.0 | 275.0 | 161.3 |
| Minn., Wis., Dak. | 28 | 8.4 | 0.9 | 8.9 | 2.7 | 6,533 | 1,434 | 8,612 | 498 | 82 | 38.9 | 1.6 | 22.6 | 7.2 |
| Okla., Kans., Mo. | 676 | 368.9 | 11.6 | 176.4 | 32.2 | 16,351 | 1,871 | 13,065 | 1,217 | 709 | 396.9 | 11.8 | 167.8 | 30.7 |
| Inland Texas | 280 | 181.4 | 12.4 | 49.2 | 20.9 | 6,475 | 413 | 2,120 | 2,090 | 256 | 206.3 | 7.6 | 48.5 | 26.4 |
| Texas Gulf Coast | 1,838 | 937.7 | 130.7 | 463.4 | 188.0 | 22,295 | 3,478 | 17,018 | 8,373 | 1,792 | 924.3 | 97.7 | 432.3 | 208.6 |
| La. Gulf Coast | 689 | 364.5 | 56.4 | 163.6 | 54.6 | 10,027 | 1,929 | 7,769 | 1,565 | 614 | 355.5 | 31.9 | 164.4 | 42.2 |
| N. La. and Ark. | 101 | 40.4 | 7.3 | 27.0 | 7.3 | 4,161 | 830 | 2,406 | 107 | 85 | 35.5 | 5.7 | 18.8 | 5.6 |
| Rocky Mountain: | | | | | | | | | | | | | | |
| New Mexico | 20 | 12.2 | 0.3 | 3.9 | 1.1 | 433 | 19 | 131 | 52 | 28 | 15.4 | 0.5 | 5.5 | 3.5 |
| Other Rocky Mt. | 265 | 126.0 | 4.0 | 62.1 | 31.1 | 4,190 | 342 | 2,972 | 833 | 261 | 128.2 | 3.5 | 61.8 | 34.2 |
| West Coast | 1,145 | 454.4 | | 203.0 | 265.1 | 22,426 | 334 | 14,404 | 34,055 | 1,151 | 474.8 | 1.5 | 160.1 | 345.2 |
| Oct. 17, 1958 | 7,613 | 3,713.0 | 350.3 | 1,814.9 | 976.9 | 170,361 | 31,520 | 161,341 | 68,020 | 7,650 | 3,895.1 | 265.5 | 1,705.3 | 1,051.7 |
| Oct. 10, 1958 | 7,723 | 3,948.0 | 323.1 | 1,756.0 | 944.7 | 172,914 | 31,364 | 158,742 | 68,996 | | | | | |
| Oct. 18, 1957 | 7,861 | 3,962.3 | 256.3 | 1,728.7 | 1,074.7 | 179,263 | 35,012 | 173,785 | 58,823 | | | | | |

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

# Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

## REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

### GASOLINE*

| | |
|---|---|
| **Mid-Continent (Group 3):** | |
| ★ Regular (89 octane) | 11.50-11.625 |
| ★ Premium (99 octane) | 14.50-14.625 |
| **Gulf Coast (cargoes for coastwise or export movements):** | |
| Regular (90 octane) | 10.25 |
| Regular (92 octane) | 10.50 |
| Premium (97 octane) | 11.625 |
| Premium (98 octane) | 11.75 |
| **California (rack) (Los Angeles):** | |
| Regular (88 octane) | 12.2-13.7 |
| Premium (94 octane) | 13.2-15.5 |
| Premium (98 octane) | 14.2-16.5 |
| **Caribbean area (cargoes):** | |
| Regular (87 octane) | 9.875 |
| Premium (97 octane) | 11.625 |

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

### NATURAL GASOLINE*

| | |
|---|---|
| **Group 3:** | |
| Grade 26-70 | 4.5 |
| **Breckenridge:** | |
| Grade 26-70 | 4.0 |

*If 26-70 natural is considered as 100%, prices for lower-vapor-pressure grades increase 2.5% for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

### KEROSINE AND DISTILLATE

| | |
|---|---|
| **Mid-Continent (Group 3):** | |
| ★ Kerosine 42-44 | 10.00 |
| ★ Diesel oil (58 d.i. and above) | 9.75 |
| ★ Distillate No. 1 | 9.75 |
| ★ Distillate No. 2 | 9.00 |
| **Gulf Coast (cargoes):** | |
| ★ Kerosine 41-43 | 9.125 |
| Distillate No. 2 | 8.625 |
| **New York Harbor (barges):** | |
| Kerosine 41-43 | 9.95 |
| Distillate No. 2 | 9.45 |
| Diesel fuel, 48-52 d.i. | 10.05 |
| **Caribbean area (cargoes):** | |
| Distillate No. 2 | 8.625 |

### WAX (LB.)

| | |
|---|---|
| **Oklahoma (Group 3):** | |
| 132-135 A.m.p. (semi-refined) in tank car | 6.50 |
| **New York (export):** | |
| 126-130 A.m.p. crude-scale (solid in bags or barrels) | 7.35 |

★Denotes change from previous week.

### RESIDUAL FUEL (BBL.)

| | |
|---|---|
| **Mid-Continent (Group 3):** | |
| Residual fuel (max. 1% S) | $1.40-1.50 |
| **Gulf Coast (cargoes):** | |
| Bunker C fuel | $2.00 |
| **New York Harbor (barges):** | |
| Bunker C fuel | $2.37 |
| **Caribbean (cargoes):** | |
| Bunker C | $2.00 |
| **California (rack):** | |
| Bunker C fuel, Los Angeles | $2.10 |

### LUBRICATING OILS

| | |
|---|---|
| **Mid-Continent (Group 3):** | |
| 150-160 bright stock, solvent refined, 0-10 pp., 95 v.i. | 23.0 |
| 200 vis. neutral oil, solvent refined, 0-10 pp., 95 v.i. | 20.5 |
| **Pennsylvania Grade:** | |
| 145-155 vis. at 210, bright stock, 8 color, 25 p.t. | 22 |
| 200 vis. neutral (180° at 100°), 25 p.t. | 21 |

## CRUDE-OIL PRICES

### GRAVITY SCHEDULE

| | Signal Hill, Calif. | Mid-Cont.* | Gulf Coast Tex.† | West Tex.‡ N.M. | Wyo. (sour) |
|---|---|---|---|---|---|
| 14-14.9 | $1.86 | .... | .... | .... | .... |
| 15-15.9 | 1.95 | .... | .... | .... | $1.81 |
| 16-16.9 | 2.04 | .... | .... | .... | 1.86 |
| 17-17.9 | 2.13 | .... | .... | .... | 1.91 |
| 18-18.9 | 2.23 | .... | .... | .... | 1.96 |
| 19-19.9 | 2.32 | .... | .... | .... | 2.01 |
| 20-20.9 | 2.41 | $2.75 | .... | $2.62 | 2.06 |
| 21-21.9 | 2.50 | 2.77 | .... | 2.64 | 2.11 |
| 22-22.9 | 2.60 | 2.79 | .... | 2.66 | 2.16 |
| 23-23.9 | 2.69 | 2.81 | $3.44 | 2.68 | 2.21 |
| 24-24.9 | 2.78 | 2.83 | 3.46 | 2.70 | 2.26 |
| 25-25.9 | 2.87 | 2.85 | 3.48 | 2.72 | 2.31 |
| 26-26.9 | 2.96 | 2.87 | 3.50 | 2.74 | 2.36 |
| 27-27.9 | 3.06 | 2.89 | 3.52 | 2.76 | 2.49 |
| 28-28.9 | 3.11 | 2.91 | 3.54 | 2.78 | 2.54 |
| 29-29.9 | 3.16 | 2.93 | 3.56 | 2.80 | 2.59 |
| 30-30.9 | 3.22 | 2.95 | .... | 2.82 | 2.63 |
| 31-31.9 | 3.27 | 2.97 | .... | 2.84 | 2.67 |
| 32-32.9 | 3.33 | 2.99 | .... | 2.86 | 2.71 |
| 33-33.9 | 3.38 | 3.01 | .... | 2.88 | 2.75 |
| 34-34.9 | 3.44 | 3.03 | .... | 2.90 | 2.79 |
| 35-35.9 | 3.49 | 3.05 | .... | 2.92 | 2.83 |
| 36-36.9 | 3.55 | 3.07 | .... | 2.94 | 2.87 |
| 37-37.9 | 3.60 | 3.09 | .... | 2.96 | 2.89 |
| 38-38.9 | .... | 3.11 | .... | 2.98 | 2.91 |
| 39-39.9 | .... | 3.13 | .... | 3.00 | 2.93 |
| 40-44.9 | .... | 3.15 | .... | 3.02 | 2.95 |

*Includes Oklahoma (sweet), part of Kansas, North Dakota, West Texas (sweet). Some Oklahoma selling 14-31 cents under this schedule. †Low cold test crude. ‡Sour.

Effective dates of broad changes: California, 9-30-58; East of California, January 3-10, 1957; Pennsylvania Grade, 6-18-58.

### FLAT PRICES

| | |
|---|---|
| **Louisiana:** | |
| Sweet Lake | $3.00 |
| Ville Platte | 3.30 |
| **Texas:** | |
| East Texas | 3.25 |
| Conroe | 3.53 |
| Van | 3.08 |
| **Pennsylvania Grade:** | |
| Bradford | 3.90 |
| Middle District | 3.72 |
| Southwest Pennsylvania | 3.43 |
| West Virginia | 3.25 |
| Buckeye Grade | 3.25 |
| **Illinois Basin** | 3.00 |
| **Canada:** | |
| Leduc-Woodbend | 2.67 |
| Redwater (Alta.) | 2.56 |
| Smiley (Sask.) | 2.33 |
| Pembina | 2.52 |

### FOREIGN

| | |
|---|---|
| **Venezuela:** | |
| Cumarebo, 48°-49.9°, Tucupido | 3.75 |
| San Joaquin, 41°-41.9°, Puerto La Cruz | 3.34 |
| Oficina, 35°-35.9°, Puerto La Cruz | 3.05 |
| Tia Juana medium, 26°-26.9°, Amuay* | 2.55 |
| Quiriquire, 16.0°-16.4°, Caripito | 2.15 |
| Lagunillas heavy, flat, Las Piedras* | 2.10 |
| Las Piedras* | 2.10 |
| Bachequero, flat, 15°-16°, Las Piedras* | 1.93 |

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

| | |
|---|---|
| **Middle East, Persian Gulf (cargoes, f.o.b. lifting port):** | |
| Arabian, 36.0°-36.9°, Ras Tanura | $2.12 |
| Iranian, 34.0°-34.9°, Bandar Masur | 2.04 |
| Iranian, 34.0°-34.9°, Ababan | 1.99 |
| Iraq, 35.0°-35.9°, Fao | 1.98 |
| Kuwait, 31.0°-31.9°, Mina-al-Ahmadi | 1.85 |
| Qatar, 41.0°-41.9°, Umm Said | 2.23 |
| **Middle East, E. Mediterranean:** | |
| Arabian, 36.0°-36.9°, Sidon | 2.49 |
| Iraq, 36.0°-36.9°, Tripoli, Banias | 2.49 |
| **Far East (cargoes, f.o.b. Lutong, Sarawak):** | |
| Seria Light, 37° | 2.75 |

### TANKER RATES PER LONG TON

(Latest reported spot fixtures)

| | |
|---|---|
| ★ Carib.-Norway, dirty (Scale—45%) (19s. 2d.) | $2.68 |
| ★ P.P.-Calif., dirty (USMC—70%) | 4.89 |
| ★ P.G.-Venice, dirty (USMC—45%) | 4.54 |
| Carib.-U.S.N.H., dirty (USMC—50%) | 1.35 |

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(LARGE STOCK)
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12¾" O.D. x .250 and .280 wall, Range 2-3

WILL TRADE FOR
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DRILLING / PRODUCTION Accountant. Contractor / Producing experience: Financial Statements, Joint Billing, Lease Records, Administrative Procedures. Box K-915, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—5¾ years Major Oil Company West Texas. Wide experience in exploration development and workovers; both well site and office. Desires to relocate in Oklahoma—North Texas—South Kansas area. Resume and interviews on request. Box K-912, The Oil and Gas Journal, Tulsa, Oklahoma.

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GEOPHYSICS SUPERVISOR: Eight years experience in Texas, Louisiana, Mississippi, Rocky Mountain area, Australia and Venezuela. Box K-928, The Oil and Gas Journal, Tulsa, Oklahoma.

PERSONAL PILOT
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Desire position as personal pilot and legal assistant. Have commercial pilot's license, auditing experience; will receive law degree from Oklahoma University, January, 1959. Personal data sheets available. Box K-926, The Oil and Gas Journal, Tulsa, Oklahoma.

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LANDMAN—37—9 years experience in Mid-Continent and Gulf Coast with Major and Independent. Commercial Pilot. Desire employment with active independent. Box K-933, The Oil and Gas Journal, Tulsa, Oklahoma.

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PRINCIPALS with moderate funds interested in shallow, low gravity, stripper production from sandstone reservoirs. Send all data. Box K-911, The Oil and Gas Journal, Tulsa, Oklahoma.

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### REAL ESTATE

FOR SALE—By owners, practically new modern one story office building, 60 by 80 feet, cooling and heating system. Suitable for partitioning. Near Okla. state capitol. Off street parking lot. No agents. Box K-913, The Oil and Gas Journal, Tulsa, Oklahoma.

### LEGAL

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that approximately 159.21 acres of land in three parcels within the known geologic structure of the Monroe gas field, Louisiana, will be offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 1:00 p.m., E.S.T., November 5, 1958, when bids will be opened. Full details of the lease offering, and how and where to submit bids, may be obtained from the Manager, Eastern States Land Office, Bureau of Land Management, Washington 25, D. C. H. K. Scholl, Manager.

### LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that 160 acres of land in one parcel within the known geologic structure of the Fiddler Creek field, Wyoming, will be offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 2:00 P.M., MST, December 2, 1958, when bids will be opened. Full details of the lease offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Craig A. Decker, Manager.

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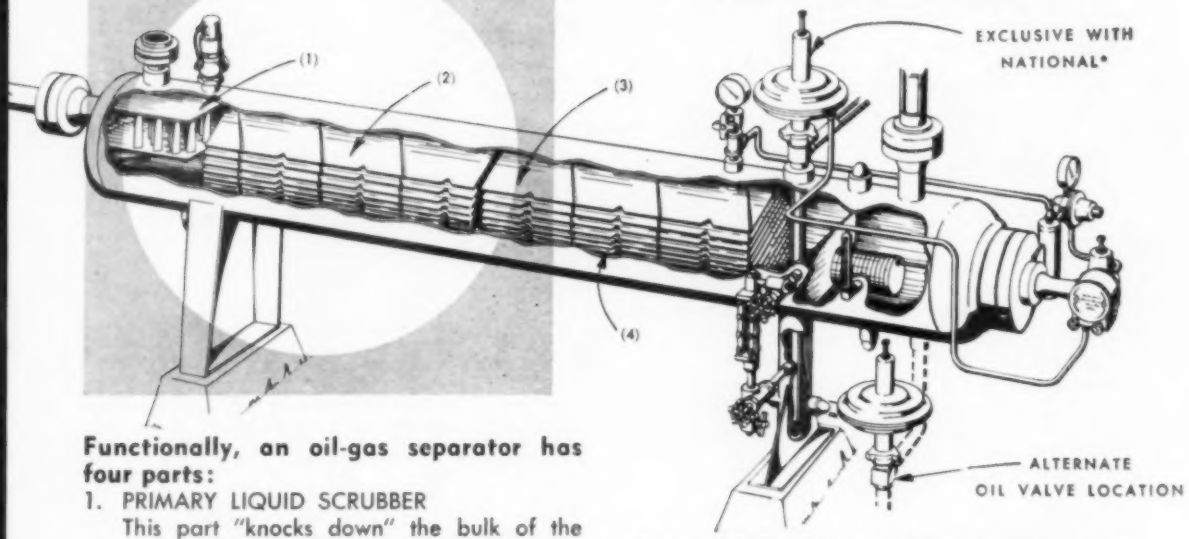


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   Also as a result of these tests, proper spacing and length of Main Gas Scrubber plates was discovered, so as to effect the greatest liquid removal from the gas stream.
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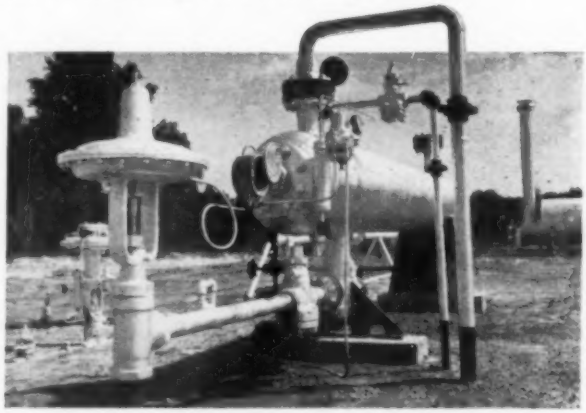

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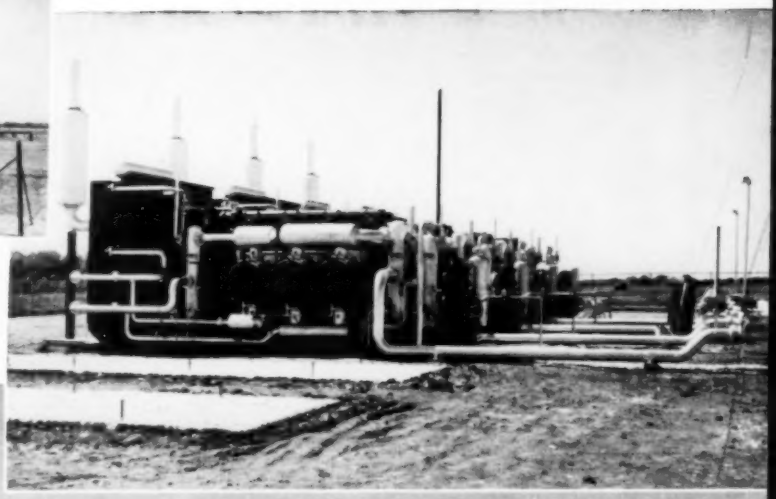

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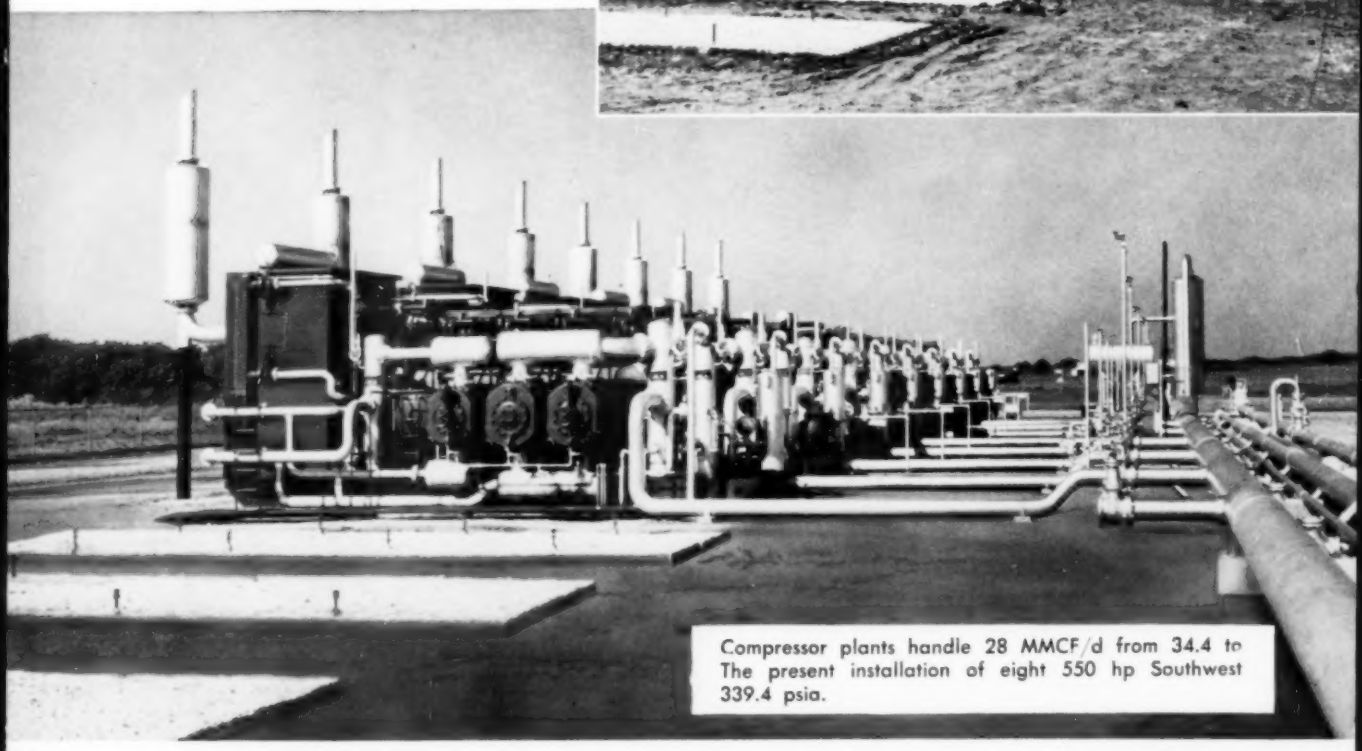

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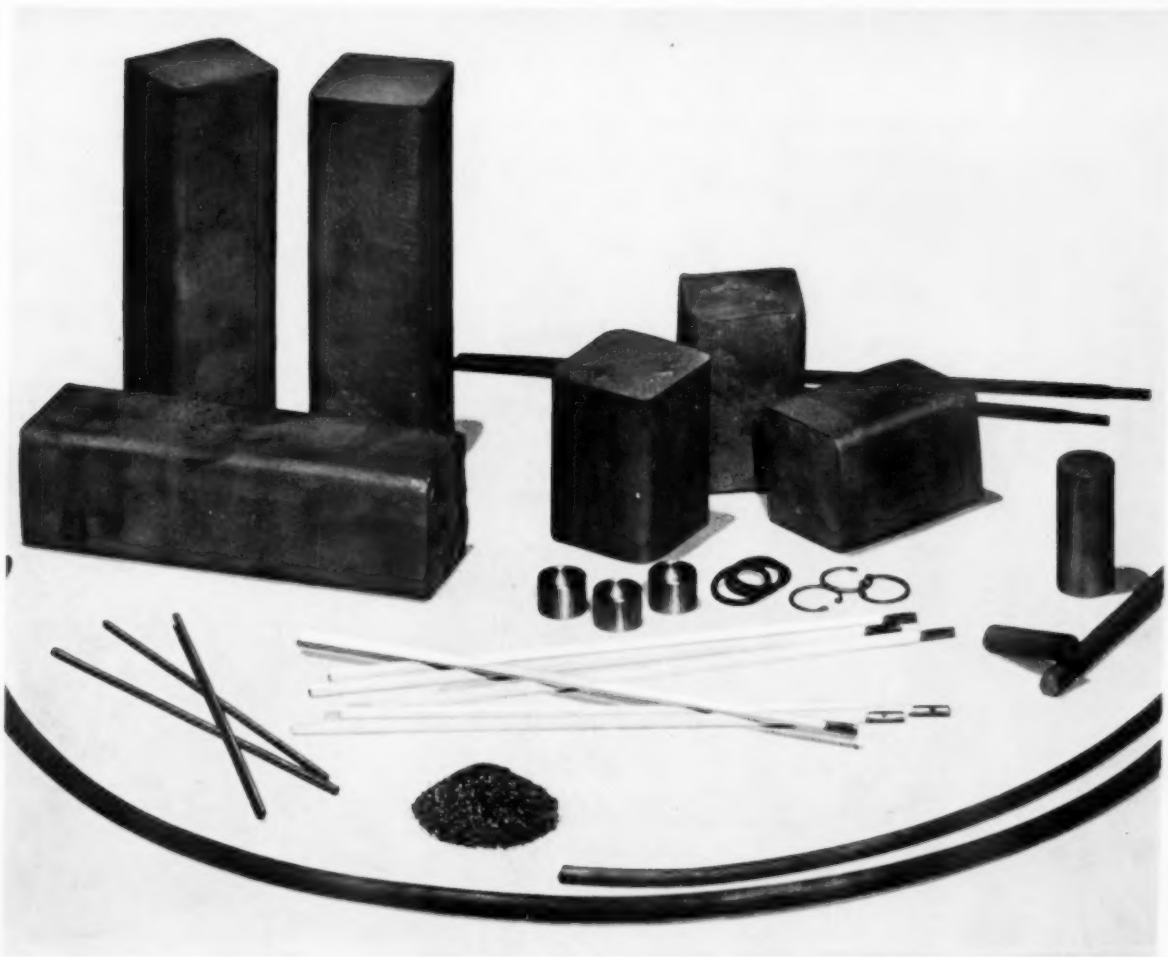

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